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ERRATA

Page	41	lines 1 and 2	delete 'or xanthosis'	
		line 2	for 'xii, p. 520'	read 'ix, p. 193'
	42	30	,, '*Rynchelytrum*'	,, '*Rhynchelytrum*'
	43	31	,, '*Inst.*'	,, '*Council*'
	48	7	,, 'leaf roll'	,, 'crinkle'
	83	8	,, 'Schilcher (R.)'	,, 'Schilcher (E.)'
	92	30	,, 'Webster'	,, 'Wester'
	112	16	,, 'p. 739'	,, 'p. 729'
	143	lines 36, 37	delete 'including strains . . . *moniliformis*'	
	162	line 1	for 'Jacono (L.)'	read 'Jacono (I.)'
	201	13	,, '*Veronia*'	,, '*Vernonia*'
	207	8	,, '*cantala*'	,, '*cantula*'
	211	48	delete 'Corbett (W.)'	
	242	33	for 'Suit (F. R.)'	,, 'Suit (R. F.)'
	305	8	,, 'Gutner (A. S.)'	,, 'Gutner (L. S.)'
	310	31	,, 'monosulphate'	,, 'monosulphide'
	313	9	,, '*quercum*'	,, '*quercuum*'
	373	33	,, '(Seim) Sacc.'	,, '(Siem.) Siem.'
	390	31	,, 'curl'	,, 'roll'
	409	20	,, 'Ohio'	,, 'Oregon'
	425	42	,, 'ix'	,, 'xii'
	457	43	,, 'Fajardo' (T. J.)	,, 'Fajardo (T. G.)'
		46	,, 'lviii'	,, 'liii'
	458	8	,, '*eximus*'	,, '*eximius*'
	460	19	,, 'Volonsky'	,, 'Volkonsky'
	602	26	,, '*H.*'	,, '*P.*'
	614	12	,, 'Nicolaisen (A.)'	,, 'Nicolaisen (N.)'
	637	2	,, '*Microsporon*'	,, '*Monosporium* [*Scedosporium*]'
	667	46	,, 'root rot of violets'	,, 'violet root rot of asparagus'
	676	14	,, 'reclamation'	,, 'grey speck'
	714	28	,, 'shot hole'	,, 'leaf curl'
		29	,, '*Clasterosporium carpophilum*'	,, '*Taphrina deformans*'

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IMPERIAL MYCOLOGICAL INSTITUTE

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HANSEN (H. N.) & SMITH (R. E.). **A bacterial gall disease of the Douglas Fir.**—*Science*, N.S., lxxvii, 2009, p. 628, 1933.

Douglas fir (*Pseudotsuga taxifolia*) trees from 3 to 15 years old in California are liable to develop twig and stem galls due to an organism resembling *Bacterium* [*Pseudomonas*] *savastanoi* [*R.A.M.*, xii, p. 521], which may increase in size for many years, sometimes killing the top or the whole tree. The globular galls, which may reach a diameter of several inches, are composed of hypertrophied tissues of the stele and cortex, with a rough, spongy, fissured surface. The non-motile bacterium is readily isolated from the gall cells, where it frequently occurs in pairs, its size averaging 1·9 to 3·9 by 0·5 to 1·5 μ. It forms white colonies with a metallic sheen, fairly smooth surface, and undulate margin. Typical galls were produced on Douglas firs by inoculation with the organism, which was subsequently re-isolated.

VAN WYK (J. H.). **An economically constructed farm shed of chemically treated wood.**—*Farming in South Africa*, viii, 85, p. 155, 1 fig., 1 diag., 1933.

Some examples are given of the utilization for construction purposes of non-durable species of timber after preservative treatment as demonstrated by the Forest Products Institute, Pretoria West. No sign of deterioration is shown after eight years' service by young, exotic, plantation-grown poles treated with a mixture of 60 per cent. oil and 40 per cent. creosote [*R.A.M.*, xii, pp. 345, 670], which have been widely used in South Africa in the erection of tobacco and farm sheds and the like. Details are given of the costs of treating the different timbers required for building purposes, and of the construction of a farm shed with treated wood recently erected at the Institute.

WINKELMANN (A.). **Zur Frage der Gemüsesamenbeizung.** [On the question of vegetable seed disinfection.]—*Mitt. Deutsch. Landw.-Gesellsch.*, xlviii, 13, pp. 246–247, 1933.

In connexion with recent experiments by himself and others on the disinfection of vegetable seeds, the writer discusses the question of the limits of tolerance for certain preparations. Lettuce seed is liable to injury from germisan (30 minutes' immersion at 0·125 per

cent.) [*R.A.M.*, xii, p. 264] and uspulun (0·25 per cent.). Uspulun (0·25 per cent., 30 minutes' immersion) caused injury to tomato seed amounting to over 50 per cent. in two cases, but germisan proved fairly safe, though sometimes causing slight injury. Carrot and cucumber seeds usually withstood uspulun well but were injured by 30 minutes in 0·25 per cent. germisan. The dusts abavit B, ceresan, tillantin R, and tutan were satisfactory with carrots, cucumbers, and peas. Beans [*Phaseolus vulgaris*] were readily injured by germisan (0·25 per cent. solution for 30 minutes) and tutan dust, while with uspulun, abavit B, ceresan, and tillantin R, slighter damage was sustained.

GIBBS (J. G.). **Weed host plants of club-root in New Zealand.**—*New Zealand Journ. of Agric.*, xliv, 4, pp. 273–276, 1932.

Seeds of a number of cruciferous weeds collected during the summer of 1928–9 were sown on soil infested by the finger-and-toe organism (*Plasmodiophora brassicae*) in order to determine their part, if any, in the perpetuation of the fungus under New Zealand conditions [*R.A.M.*, xii, p. 412]. A table is given showing the results of four tests, with notes on the outcome of similar experiments by other workers. Four of the susceptible plants are believed to be hitherto unrecorded as hosts of *P. brassicae*.

In one test, in which finger-and-toe developed profusely on most species, the roots of plants of those species resisting infection were dipped in a spore suspension of the fungus and transplanted to heavily infested boxes. The species maintaining their resistance under these conditions were *Barbarea verna*, *B. stricta*, *B. vulgaris* [ibid., xii, p. 346], and *Coronopus didyma*.

By dipping the roots of seedlings in a spore suspension before planting in healthy soil, it was ascertained that the cultivated hosts of *P. brassicae* in New Zealand include swedes, turnips, thousand-headed and Buda kale, chou moellier, mustard, cabbage, cauliflower, broccoli, and Brussels sprouts. Infection was secured in every case by the distribution over rape plants [*Brassica napus*] in sterilized soil of spore suspensions from tumours on *Brassica arvensis*, *B. campestris*, *B. oleracea*, *Diplotaxis tenuifolia*, *Cheiranthus cheiri*, *Lunaria biennis*, *Lepidium campestre*, *Sisymbrium orientale*, and *Arabis albida*.

The practical significance of susceptible weeds as a means of perpetuating the fungus is briefly discussed.

BLANK (L. M.) & WALKER (J. C.). **Inheritance of Fusarium resistance in Brussels Sprouts and Kohlrabi.**—*Journ. Agric. Res.*, xlvi, 11, pp. 1015–1022, 1933.

The study [details of which are given] during three consecutive years in Wisconsin of the inheritance of resistance to cabbage yellows (*Fusarium conglutinans*) in commercial varieties of Brussels sprouts (*Brassica oleracea gemmifera*) and kohlrabi (*B. o. caulo-rapa*) indicated that in these two hosts, as previously shown for both wild and cultivated cabbage [*R.A.M.*, xii, p. 608], resistance to the disease is based on a single-factor difference, a further inference being that this factor is probably carried by the same gene in all four sub-species of *B. oleracea*. The whole

work is considered to demonstrate the possibility of breeding homozygous resistant lines of Brussels sprouts and kohlrabi from resistant individuals grown on yellows-infected soil.

YOSHII (H.). **On three species of Alternaria parasitic on cruciferous plants.**—*Bull. Sci. Fakultato Terkultura, Kjusu Imper. Univ.*, v, 3, pp. 221–235, 5 figs., 1933. [Japanese, with English summary.]

The species of *Alternaria* parasitic on crucifers in Japan are classified as follows: *Alternaria brassicae* (Berk.) Sacc. (with which *A. oleracea* and *A. circinans* (B. & C.) Bolle are regarded as synonymous), *A. brassicae* var. *macrospora* Sacc., and *A. herculea* (the synonyms of which are *Macrosporium brassicae* var. *macrospora* Eliasson, *Sporidesmium brassicae*, *A. brassicae* (Berk.) Bolle, and *A. macrospora* (Sacc.) Sawada) [*R.A.M.*, xii, p. 546]. Authentic cultures of Bolle's species [ibid., iv, p. 60] were obtained from the Centraalbureau voor Schimmelcultures for purposes of comparison. *A. brassicae* attacks mainly cabbage (*Brassica oleracea* and allied species); its spore dimensions are 15 to 86 by 8 to 22 μ. *A. herculea* occurs on *B. chinensis*, *B. rapa* [*B. campestris*], *B. napella* [*B. campestris*], cabbage, and radish; its spores measure 70 to 260 by 14 to 26 μ. *A. brassicae* var. *macrospora*, found on radish and cabbage (*B. oleracea*, *B. chinensis*, and related species), is characterized by medium-sized spores, 60 to 150 by 10 to 23 μ.

STARR (G. H.) **A study of diseases of canning crops (Peas and Corn) in Minnesota.**—*Minnesota Agric. Exper. Stat. Tech. Bull.* 89, 51 pp., 12 figs., 2 graphs, 1932. [Received September, 1933.]

This is a comprehensive report of the author's investigations from 1926 to 1931 of the diseases affecting field peas and sweet maize, especially those grown for canning, in Minnesota. While peas were found to be occasionally attacked by most of the usual diseases known on this crop in the United States, the bacterial blight (*Pseudomonas pisi*) [*R.A.M.*, xii, p. 412], root rot (*Fusarium martii* var. *pisi* and *Aphanomyces euteiches*) [ibid., xii, p. 413], and seedling blight (*Rhizoctonia* and *Fusarium* spp.) are probably the most prevalent in Minnesota. Special attention was given to *Fusarium* wilt, which shows indications of becoming one of the most destructive diseases in the State. Isolations and pathogenicity tests showed that in Minnesota the wilt is caused by several species of *Fusarium*, among which *F. orthoceras* var. *pisi* [ibid., xii, p. 547] is the most widespread; another species frequently isolated from wilted plants in the field was identified as *F. bullatum* Sherb. (*F. equiseti* var. *bullatum* Wr.) [ibid., x, p. 626] and was shown to cause a rapid wilt of young pea plants; while a third, identified as *F. acuminatum* Ell. and Ev. (*F. scirpi* var. *acuminatum* Wr.) [loc. cit.], also caused a wilt in several varieties of peas, but appeared to be less virulent than the other two. The largest number of wilted pea plants occurred at 28° C. with two strains and at 24° with a third, and in the wettest soil tested, though varying amounts of soil moisture had only a slight effect on the development of the disease; the optimum soil reaction

appeared to be P_H 8·52 but some disease occurred between 5·07 and 9·69. There was evidence of variations in the varietal resistance of peas to wilt, and several single-plant selections are being studied for resistance and trueness to type. Transmission of the *Fusarium* wilt by means of the seed was demonstrated: the fungi were found in the seed-coat but not in the cotyledons or embryos of peas collected from wilted plants.

The most common diseases of sweet maize observed in Minnesota were smut (*Ustilago zeae*), rust (*Puccinia sorghi*) [*P. maydis*: ibid., xi, p. 170], and root rot and seedling blight (*Gibberella saubinetii*) [ibid., xii, p. 505], of which the first- and last-named appear to be the most destructive. Organic mercury dusts at the rate of 2 or 3 oz. per bushel of seed-grain were found to be the most satisfactory in the control of seedling blight. Seed-grain harvested before full maturity or dried at too high a temperature showed a predisposition to the blight.

CARSNER (E.), ABEGG (F. A.), CORMANY (C. E.), ELCOCK (H. A.), KELLER (W.), LOWE (C. C.), OWEN (F. V.), PACK (D. A.), PRICE (C.), & SKUDERNA (A. W.). **Curly-top resistance in Sugar Beets and tests of the resistant variety U.S. No. 1.**— *U.S. Dept. of Agric. Tech. Bull.* 360, 68 pp., 4 figs., 1 graph, 1 diag., 1 map, 1933.

An important advance in the production of a commercial variety of sugar beet resistant to curly top [*R.A.M.*, xi, p. 162; xii, p. 349] is marked by the release by the United States Department of Agriculture of a new variety, U.S. No. 1. This is derived from a combination of resistant strains, including '5001', obtained from an extensive mass selection from severely affected fields in Idaho and Utah during the epidemic of 1926, the 'Washington strain' obtained from a large primary mass selection made from commercial fields in the Yakima valley in 1923, the inbred line 905a2, several first-generation hybrids between this and other strains, and the three strains 6677–24, 3929, and De Rekowski.

In an extensive series of tests conducted in 1931 under conditions where curly top was an important factor, U.S. No. 1 gave average yields of 14·8, 20·9, 23·8, and 13·4 tons per acre for Idaho, Utah, California, and New Mexico, respectively, the corresponding figures for the commercial varieties used being 10·1, 13·2, 17·3, and 6·7. Where curly top, however, was absent or negligible, the average difference in yield between U.S. No. 1 and the commercial varieties was only 0·5 ton per acre in favour of the former.

The average sucrose percentage of U.S. No. 1 was lower by a fraction of one per cent. than that of the commercial brands, but there was no significant difference in purity.

The drawbacks to the new variety are that its resistance is not complete and that it tends to 'bolt', though in this respect it may be greatly improved by additional selection. While it is not yet to be regarded as a finished product, its general adoption should give an appreciable degree of curly top control and is recommended until a better variety has been produced from the other strains now being tested.

BREMER (H.). **Ueber den Zwiebelrotz.** [On the Onion slime.]—*Die Kranke Pflanze*, x, 7–8, pp. 97–99, 3 figs., 1933.

The information in this brief note on the 'Rotz' or slime disease of onions in Germany has already been noticed from other sources [*R.A.M.*, ix, pp. 223, 620; x, p. 329].

PIRONE (P. P.), NEWHALL (A. G.), STUART (W. W.), HORSFALL (J. G.), & HARRISON (A. L.). **Copper seed treatments for the control of damping-off of Spinach.**—*Cornell Agric. Exper. Stat. Bull.* 566, 25 pp., 6 figs. (1 on cover), 8 graphs, 1933.

After a brief reference to the considerable financial losses caused to spinach growers in New York by damping-off, most commonly associated with *Pythium ultimum* [*R.A.M.*, xi, p. 344], the authors give a detailed account of their experiments on the control of the trouble by seed treatment. The results showed that damping-off was successfully checked either by soaking the seed for an hour in 1 per cent. copper sulphate solution or by dusting it with red (cuprous) oxide of copper [cf. ibid., xii, p. 232] at the rate of one level teaspoonful of the powder to 1 lb. (or 1 lb. to 65 lb.) of seed, care being taken to coat the latter thoroughly with the dust. In field tests on more than twenty farms in 1932 the average increase in yield of spinach resulting from either treatment amounted to over two tons per acre. Both treatments also gave promising results in preliminary experiments on the control of seed-borne diseases of a number of other vegetables, including beet, cucumber, melon, squash, tomato, eggplant, pepper, Lima bean, and pea; and in the case of spinach their cost is stated not to have exceeded 25 cents per acre.

Somewhat less favourable control was obtained by seed treatment with other fungicides, including copper carbonate, semesan, monohydrated copper sulphate, calomel [mercurous chloride], and mercuric oxide dusts, and with mercuric chloride solution.

YOSHII (H.). **Pathological studies on Watermelon wilt. I. On the mode of infection of the causal fungus, Fusarium niveum, E.F.S.**—*Bull. Sci. Fakultato Terkultura, Kjusu Imper. Univ.*, v, 3, pp. 313–326, 12 figs., 1933. [Japanese, with English summary.]

Fusarium niveum, the agent of watermelon wilt [*R.A.M.*, xii, p. 418], first invades the root cap, passing thence to the primordial meristem, or it may directly attack the primary meristem. From the latter it enters the stele, passing through and between the meristematic cells, though in its passage into the root through the root cap or the young piliferous layer it is always intercellular. Once within the stele, the fungus progresses actively along the xylem elements, destroying the tissues and so inducing the wilt. When the primary cortex is invaded through the young piliferous layer, a blight of the parenchyma may result, but the stele cannot be entered from this tissue owing to the early suberization of the endodermis. Penetration into the cortex at a later stage is prevented by the suberization of the exodermis, which occurs as soon as the root hairs have ceased activity. The fungus may, however, invade the root cortex through the rupture produced by the

emergence of a secondary root, but here again the stele is protected by the endodermis, the suberization of which is stimulated by the emergence of the new root. The penetration of the root cap and invasion of the meristematic tissue may occur within 16 hours at 23° C. The term ' meristematic infection ' is specially applicable to the action of *F. niveum*, which is dependent for its further progress within the vascular tissues on invasion of the meristematic tissue [cf. ibid., x, p. 379].

WATANABE (T.). **Studies on some characters of Corticium centrifugum parasitic on Calabash plant.**—*Bull. Utsonomiya Agric. Coll.*, Nippon, *1933*, 3, pp. 1–16, 1 pl., 1933.

The author gives a brief historical review of the literature dealing with the identification of the perfect stage of Japanese strains of *Sclerotium rolfsii* Sacc. with *Corticium centrifugum* (Lév.) Bres. [but without reference to Curzi's recent work on *S. rolfsii* and allied forms in Italy and the United States: *R.A.M.*, xi, p. 748]. This is followed by a fully tabulated account of his morphological and physiological studies of a sclerotial fungus identified as *S. rolfsii* which causes a serious disease of calabash (*Lagenaria vulgaris* var. *depressa*) near Utsonomiya, Japan. The plants are attacked in the field about the middle of August, when the silky, white mycelium appears on the stems at soil level. The surface of the affected areas assumes a brown, water-soaked discoloration of irregular extent, later becoming somewhat sunken; gum is exuded and eventually the diseased parts undergo severe necrosis. The upper parts of the stem frequently wilt, and as infection progresses the whole plant dies. Numerous vinaceous-fawn, spherical, ellipsoid, or irregular sclerotia, averaging 0·66 by 0·83 mm., are produced on the diseased areas. The sclerotia consist of an outer zone of one or two layers of yellowish-brown, roundish, polygonal or irregular cells and an inner one of three or four layers of hyaline or light brown, hexagonal or polygonal cells, intermingled with some elongated or dumb-bell shaped, hyaline mycelial elements. Of the 20 different media used for the culture of *S. rolfsii*, Japanese soy-bean and apricot decoctions, with and without the addition of agar, proved the most favourable, followed by carrot, potato, and calabash. The minimum, optimum, and maximum temperatures for mycelial growth were found to be 11° to 15°, 28°, and above 38° C., respectively.

Inoculation experiments with the fungus on paddy and upland rice, tomato, pepper [*Capsicum annuum*], broad beans [*Vicia faba*], squash [*Cucurbita* sp.], *L. vulgaris* vars. *microcarpa* and *clavata*, watermelon, *Luffa cylindrica*, and sweet potato gave positive results [cf. ibid., xi, p. 349].

WATANABE (T.). **Vitality of Corticium centrifugum parasitic on Calabash plant.**—*Bull. Utsonomiya Agric. Coll.*, Nippon, *1933*, 3, pp. 17–27, 1933.

The sclerotia and mycelium of *Sclerotium rolfsii* from calabash (*Lagenaria vulgaris* var. *depressa*) in Nippon, Japan [see preceding abstract], were found to survive the winter in the soil, on the host, and on culture media in the laboratory. Immersed in

water, the sclerotia were destroyed in 50 minutes at 50° C. and the mycelium in 30 minutes at 45°; in the air a period of 60 minutes was necessary to kill the sclerotia and 20 minutes for the mycelium. The sclerotia of *S. rolfsii* were destroyed within 45 minutes by immersion in 0·1 per cent. corrosive sublimate and the mycelium in 15 minutes at 0·01 per cent. Formalin killed the sclerotia in 150 minutes at 0·5 per cent., in 60 at 1, and in 30 at 3 per cent., the mycelium being destroyed by this solution at 0·5 per cent. in 15 minutes. Caustic potash was effective at 1 per cent. in 15 minutes for the sclerotia and at 0·5 per cent. in the same time for the mycelium.

CHARLES (VERA K.) & LAMBERT (E. B.). **Plaster moulds occurring in beds of the cultivated Mushroom.**—*Journ. Agric. Res.*, xlvi, 12, pp. 1089–1098, 4 figs., 1933.

This is a brief account of the authors' study in pure culture of two injurious moulds (respectively designated as the 'white' and the 'brown' plaster moulds) which are stated to be commonly present in mushroom [*Psalliota campestris*] beds in the United States. The first and most dangerous of the two was identified as *Monilia fimicola* Cost. & Matr., a name which the authors prefer to *Oospora fimicola* Cub. & Megl. [*R.A.M.*, xii, p. 352]. All the collections of this fungus from various localities in the United States and one from England were morphologically identical, but there were considerable cultural differences, and flask cultures were frequently observed to give rise to sectors. As an illustration of the economic importance of this disease, it is stated that a grower in California suffered a loss estimated at from $20,000 to 30,000 in a period of four years owing to its ravages.

The brown mould (typically a surface grower both in nature and on culture media) forms at first white, later tan, and finally cinnamon-brown patches, 6 to 15 inches in diameter, on the surface of the mushroom beds, sometimes coalescing to form a continuous coating over the surface of the compost. The mushroom mycelium appears to have considerable difficulty in penetrating these patches, so that the growth is delayed and the yield reduced. The fungus, so far as the writer is aware, has not been recorded in Europe in connexion with mushroom growing. It was identified as *Myriococcum praecox*, a sclerotial fungus described by Fries in 1823, the systematic position of which is obscure.

Although *Monilia sitophila* [ibid., x, p. 502] occasionally occurs in the United States as a contamination of mushroom spawn, it is seldom, if ever, found in composted manure in association with the white and brown plaster moulds.

VENKATARAYAN (S. V.). **Downy mildew. A serious disease of Grape Vines in Mysore.**—Reprinted from *Journ. Mysore Agric. & Exper. Union*, xiii, 3, 4 pp., 1 pl., 1933.

A popular note is given on the symptoms of downy mildew of the vine (*Plasmopara viticola*) in Mysore, where the disease was first observed in 1931 and is stated to be spreading extensively [cf. *R.A.M.*, xi, p. 622], and on its control by spraying with Bordeaux mixture.

BEAUMONT (A.) & STANILAND (L. N.). **Ninth Annual Report of the Seale-Hayne Agricultural College, Newton Abbot, Devon, for the year ending September 30th, 1932.**—43 pp., 4 figs., 1933.

Owing to cold weather early in the year leaf spot of oats (*Helminthosporium avenae*) [*R.A.M.*, xi, p. 294] was exceptionally prevalent in 1932 in Devonshire, where, though there was a general recovery with the onset of warmer weather, some fields had to be resown. The soil in the affected areas contained insufficient potash and nitrates, the cold accounting for the deficiency of the latter. Glume blotch of wheat (*Septoria nodorum*) was observed for the first time in Devon. Chocolate spot [*Bacillus lathyri*: ibid., xi, pp. 143, 555] of broad beans [*Vicia faba*] caused heavy losses in several localities, most of the affected fields being deficient in potash. In early spring a bowling green in east Devon showed brown patches caused by *Fusarium nivale* [*Calonectria graminicola*: ibid., xi, p. 246]. Spotted wilt of tomatoes [ibid., xii, p. 730], introduced on plants from Cambridge, was noted for the first time in south-western England, and did very serious damage at Penzance. Raspberry mosaic [ibid., xii, p. 771] was increasingly prevalent, especially on Lloyd George canes. *Stagonospora curtisii* [ibid., xi, p. 786] caused leaf scorch of belladonna lily [*Amaryllis belladonna*], this being the first record of the disease on this host in Great Britain. Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) [ibid., xii, pp. 737, 794] was observed near Totnes, and in two localities in the vicinity plane trees were attacked by *Gloeosporium nervisequum* [*Gnomonia veneta*: ibid., xii, p. 735].

The meteorological data obtained again confirmed the value of the Dutch rules for forecasting extensive outbreaks of potato blight [*Phytophthora infestans*: ibid., xi, p. 559]. A better indication of the severity of the outbreaks was, however, given by the relative daily humidity (taken preferably at 3 p.m., when a high humidity generally indicates high humidity all day), widespread attack being indicated if this did not fall below 75 per cent. for at least two successive days, provided that the temperature was not too low. In 1929, such two-day high humidity periods occurred on about 1st and 28th July, and 3rd, 9th, and 22nd to 31st August; blight broke out on 11th July, made little progress owing to warm, dry weather, and then became general during the second week in August. In 1930, the critical two-day periods were about 10th and 20th June, 3rd, 20th, 23rd, 27th July, 2nd, 8th, and 17th to 29th August; blight appeared extensively early in August. In 1931, the first favourable period was from 4th to 12th June and the disease appeared on a large scale at the end of that month. When the 1932 humidity data for West Cornwall and Devon were combined, the daily readings for the period from 19th to 22nd May were respectively, 99, 81, 81, and 83 per cent. Widespread blight was, accordingly, expected at the end of May, and actually broke out on 30th. The humidity method of forecasting blight is thus very successful in Devon and Cornwall, though in the former locality the earlier critical dates are less reliable than the later ones.

In both counties finger-and-toe disease [*Plasmodiophora bras-*

sicae: ibid., xii, p. 412] has been observed on turnip, swede, cabbage (including ox-cabbage), Brussels sprouts, broccoli [*Brassica oleracea* var. *botrytis*], cauliflower, kohlrabi [*B. oleracea* var. *caulo-rapa*], and charlock [*B. sinapis*]. Bruce turnips and Balmoral swedes (the latter from Aberdeen) were highly resistant. On infected land the safest *Brassica* crop is marrow stem kale [*B. oleracea* var. *acephala*] which even when grown in proximity to diseased swedes has often given good results. Infection is commonest in rather acid soils (P_H 5·5 to 6·3), but is also found, even in swedes, in soils not short of lime, while in broccoli it is commoner in soils adequately provided with lime than in others. To effect control, lime must be applied in the active form and be harrowed in immediately. Hydrated lime (1 ton per acre) gave excellent control in one instance, while in a pot test with cabbage plants quicklime gave better results than hydrated lime or limestone.

Jahresberichte der Preussichen landwirtschaftlichen Versuchs- und Forschungsanstalten in Landsberg (Warthe). Jahrgänge 1931–32 und 1932–33. [Annual Reports of the Prussian Agricultural Experiment and Research Stations at Landsberg (Warthe) for the years 1931–32 and 1932–33.]—*Landw. Jahrb.*, lxxvii (Supplement), pp. 3–40, 1933.

This report contains some notes on manurial experiments in progress in connexion with lupin chlorosis [see below, p. 32] and potato scab [*Actinomyces scabies*: see below, p. 51], together with observations and experiments on the spread and control of some common diseases of plants in the area covered by the Stations.

Bericht der Lehr- und Forschungsanstalt für Wein-, Obst- und Gartenbau zu Geisenheim a. Rh, für die Rechnungsjahre 1931–32. [Report of the Viticultural, Fruit Growing, and Horticultural College and Research Institute at Geisenheim-am-Rhein for the financial years 1931–32.]—*Landw. Jahrb.*, lxxvii (Supplement), pp. 217–247, 1933.

The following items of phytopathological interest occur in this report. Hydrangea flowers were extensively affected by a green discoloration and the condition, which was found to be transmissible by grafting, is believed to be caused by a virus. It was impossible to obtain marketable plants from the progeny of the diseased individuals. Experiments with the Madame Mouillère variety (on which the discoloration was most pronounced) showed that neither alum nor nitrogen is responsible for the disorder.

Inoculation experiments on elms (*Ulmus hollandica* and *U. vegeta*) with *Graphium* [*Ceratostomella*] *ulmi* gave positive results on the former only [*R.A.M.*, xii, p. 665]. So far the infected trees have made normal growth in the years following inoculation, except for the death of a few shoots just above the site of the operation.

Uncommon diseases observed during the period under review included *Diplodia rosarum* causing spotting of the shoots and peduncles of roses [ibid., vi, p. 488]; *Marssonina potentillae*, the agent of a leaf spot of strawberries in Hanover and Middle Rhine;

and *Pyrenochaete pubescens* damaging the bark of young lime trees [*Tilia*] in Silesia.

The inoculation of certain varieties of vine with *Bacterium tumefaciens* resulted in the development of tumours ranging from the size of a pea to that of a walnut [ibid., xi, p. 655], those most severely affected being Solonis × Gutedel 42 G. pseudo-form, Berlandieri × Riparia Teleki c, Solonis × York Madeira 162 G. from Tiefenbach, Solonis × York Madeira 161, and Riesling × Solonis × Frühburgunder 95 G.

Van Poeteren (N.). **Verslag over de werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1932.** [Report on the activities of the Phytopathological Service in the year 1932.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 72, 148 pp., 8 pl., 1933.

This report, prepared on the usual lines [*R.A.M.*, xi, p. 766], contains numerous items of interest of which the following may be mentioned. Wheat was again severely injured by *Septoria nodorum* [loc. cit.] on sandy and marshy soils, a marked feature of the disease being its tendency to occur in patches.

Two forms of the yellowing disease of beets [ibid., xi, p. 767] may be distinguished, of which one has been found by [E.] Brandenburg to be due to a *Pythium* [see below, p. 57] causing a black discoloration of the xylem besides chlorosis of the leaves, which finally die [ibid., x, p. 487]. Confusion has arisen between this disease and yellowing proper, in which the rotting action of *Clasterosporium* (*Pleospora*) [*Sporodesmium*] *putrefaciens* is purely secondary [ibid., x, p. 293]. A third type of obscure disturbance observed in 1930 [ibid., xi, p. 96] appears to be curable by the application of manganese sulphate to the soil, suggesting analogies with the reclamation disease of oats.

Blue maw bird-seed [*Papaver somniferum*] was severely attacked by *Dendryphium penicillatum* [ibid., viii, p. 548] in the Oudenbosch district, where only some 15 per cent. of the plants remained free from infection.

Lettuces exported from Bussum to England were found on arrival to bear aecidia of the rust *Puccinia opizii* [ibid., ix, p. 86], the uredo- and teleutospores of which are formed on the sedge *Carex muricata*. Little damage is caused by the disease, but an urgent warning has been circulated to exporters to avoid the inclusion of affected plants in consignments to foreign countries.

Spinach leaves at Sappemeer again showed the white spotting attributed to *Cladosporium macrocarpum* [ibid., xi, pp. 222, 767], which was found to be transmitted by the seed.

Rhabdocline pseudotsugae is stated to be spreading on Douglas firs [*Pseudotsuga taxifolia*] and causing considerable injury [ibid., xii, p. 63].

Details are given of a number of investigations and experiments in the control of various important diseases. Shirlan H.B., with the addition of 0·2 per cent. agral I (Imperial Chemical Industries, Ltd.), was tested against leaf mould of tomato (*C. fulvum*) [ibid., xii, p. 403], tulip 'fire' (*Botrytis tulipae*) [ibid., xii, p. 96], cucumber leaf and fruit blight [*C. cucumerinum*: ibid., xii, p. 485], and

apple and pear scab [*Venturia inaequalis* and *V. pirina*]. Tomato plants at Naaldwijk treated with shirlan (several applications at 0·1 per cent.) presented a very satisfactory appearance in comparison with the controls, especially at first; later leaf mould developed extensively in both lots, but unlike lime-sulphur the new preparation caused no spotting of the fruits. The results in the tulip tests were conflicting, being very good in certain localities, e.g., Zwaag, where the yield of a bed sprayed six times at 0·2 per cent. was nearly double that of an untreated bed, and much less satisfactory in others. Shirlan (0·15, 0·2, and 0·3 per cent.) failed to control *C. cucumerinum* but was effective against both apple and pear scab (one experiment only with each); it caused some injury, however, to pear leaves (Louise bonne d'Avranches and Doyenné du Comice varieties).

NEUWEILER (E.). **Bericht über die Tätigkeit der Eidg. landwirtschaftlichen Versuchsanstalt Oerlikon für das Jahr 1931. IV. Pflanzenschutz.** [Report on the work of the Federal Agricultural Experiment Station Oerlikon for the year 1931. IV. Plant protection.]—*Landw. Jahrb. der Schweiz*, xlvii, 7, pp. 867–871, 1933.

Good control of wheat bunt (*Tilletia tritici*) [*T. caries*] is stated to have been given in three years' tests at Oerlikon, Switzerland, by ceretan [ceresan], while in 1931 porzol A and H dusts (Chinoin, Ujpest, Hungary) [*R.A.M.*, viii, p. 710] proved moderately satisfactory. Helion (Gesellsch. Chem. Indus., Basel) and cupro-maag (Dr. R. Maag, Dielsdorf) slightly increased the yield of potatoes in late blight (*Phytophthora infestans*) spraying experiments but failed to equal 2 per cent. Bordeaux mixture in this respect. Notes are given on various other plant diseases observed during the period covered by the report.

MCRAE (W.). **Report of the Imperial Mycologist.**—*Scient. Repts. Imper. Inst. Agric. Res., Pusa, 1931-32*, pp. 122–140, 1933.

In inoculation tests at Pusa, India, *Cercospora dolichi* isolated from *Dolichos lablab* infected *Phaseolus aconitifolius*, *P. radiatus*, *P. mungo*, *Glycine hispida*, and *Vigna catjang* [*R.A.M.*, xi, pp. 130, 475]. Three years' observations showed that the fungus is virulent during February and March, when the local climatic conditions are comparable with its optimum growth conditions in the laboratory. In culture *C. dolichi* and *C. cruenta* (the latter obtained from *P. aconitifolius*) were quite different, two saltants from the parent culture of the former also differing from four saltants of the latter, but though the two species differed from one another morphologically and physiologically, each was able to infect the host of the other.

In March, 1931, to test the natural spread of sugar-cane mosaic a row of each of 25 mosaic-free varieties was planted alternately with a row of mosaic Co. 213; at cutting-time Co. 312 and Co. 313 showed, respectively, 4·4 and 16·5 per cent. mosaic. The experiment was repeated in 1932 with 34 healthy varieties, of which Co. 337, Co. 312, Co. 327, Co. 332, Saretha, and Co. 313 developed, respectively, 1, 1, 1·1, 1·3, 22, and 48 per cent. mosaic. A further

test showed that the mean sucrose percentage was 16·27 in healthy, and 15·60 in mosaic Co. 213 cane, a mean difference of 0·67 or 4 per cent. [ibid., xii, p. 192].

A comparison of all the species of *Helminthosporium* occurring on sugar-cane in Cuba [ibid., viii, p. 134], viz., *H. ocellum*, *H. stenospilum*, and the target blotch organism [ibid., x, p. 407] with *H. sacchari* and a highly sporing saltant (S. 8) derived from it but having larger, more septate spores, showed that on certain media they all differed in cultural characters such as intensity of sporulation, zonation, and amount and colour of aerial mycelium, whereas on others they appeared to be closely allied. This was particularly evident with *H. sacchari* and *H. ocellum*. In standard growth conditions the spore measurements were within the range of *H. sacchari* and its saltants. The size and septation of the spores of *H. stenospilum* and S. 8 were alike, while *H. sacchari* and *H. ocellum* are definitely considered to be identical with one another. Inoculations of a number of sugar-cane varieties, including Co. 213, Co. 316, and Red Mauritius, with these organisms gave positive results on all. The spots produced by the different organisms varied with the variety of cane, but it was almost impossible to distinguish the fungi by their spot characters, even the target blotch *Helminthosporium* failing to produce typical spots as described on any variety of cane tried.

A serious stem rot of *Hibiscus sabdariffa* at Pusa in January is attributed to a fungus resembling *Sclerotinia sclerotiorum*; it had an optimum growth temperature of about 22°, maximum below 33°, and thermal death point above 50°. On potato dextrose agar the *Botrytis* stage developed. *S. sclerotiorum* was also recorded on sunflower [ibid., xi, p. 652].

The percentage germination of the sclerotia of *Sclerotium oryzae* in rice stubble collected in March was 87 just after collection, 76 in October, and under 4 in the following January [ibid., xi, p. 600].

In further studies of the betel vine (*Piper betle*) disease associated with a *Phytophthora*, *Rhizoctonia* [*Corticium*] *solani*, and *Sclerotium rolfsii* [ibid., xii, p. 420] strains of the *Phytophthora* on this host from Bengal, Madras, Bombay, and Malaya, were compared in culture with various other species. Statistical analysis showed that sporangial length, width, and length-to-width ratio cannot be used as criteria for specific determination in this genus. Bordeaux mixture checked the *Phytophthora* [ibid., xi, p. 283] but was less effective with *C. solani*, which in some localities destroys numerous betel vines immediately after the rains and during cold weather. As kerol [loc. cit.] kills the mycelium of *C. solani* in the soil but not inside the undecayed stems, its use must be supplemented by improved sanitation. *S. rolfsii* appears so seldom on betel vine at Pusa that prevention has not yet been attempted.

Inoculations with the *Phytophthora* causing seedling blight of *Cinchona* [ibid., xi, p. 426] gave positive results on castor seedlings [*Ricinus communis*] but not on *Colocasia antiquorum* or betel vine, while the betel vine *Phytophthora* infected *Cinchona* as well as *R. communis*. In cultural characters the *Phytophthora* obtained from *Cinchona* agreed with *P. palmivora*, and like the latter, ceased growth at 35°.

A tobacco leaf spot of the shot hole type caused by an *Alternaria* did considerable damage on one farm in Bengal.

Every year at Pusa an *Alternaria* produces brownish spots with a pale yellow ring on wheat leaves, *Alternaria* spores being commonly present also on the seed coat; the leaf spot fungus was found to be parasitic on the leaves and capable also of causing foot rot.

In 1931–2, wheat infection by *Helminthosporium sativum* and *H. tritici-repentis* was less severe at Pusa than in the preceding year, but the variety P. 52 showed 17·3 per cent. leaf area destroyed, as against only 2·1 per cent. in 1930–1. Seed disinfection with uspulun-universal (0·25 per cent.) gave better control of *H. sativum* and *H. teres* than did formalin (1 in 320).

Forty-fifth Annual Report of the Kentucky Agricultural Experiment Station for the year 1932. Part I.— 75 pp., 1933.

The following, amongst other items of phytopathological interest, occur in this report. For the seventh consecutive year, tobacco mosaic was practically controlled at setting time on the Station farm by requiring the men to wash their hands before pulling the plants, and to chew manufactured plug instead of barn-cured tobacco, and by employing a non-user of tobacco for weeding [cf. *R.A.M.*, xii, p. 205]. At topping time one field thus safeguarded of 10,700 plants showed 0·54 per cent. mosaic and another of 9,454 plants, 4·75 per cent. The latter field had been under tobacco the previous year, when 2·7 per cent. mosaic was counted at cutting time, and the difference between the two fields suggests the transmission of infection through the soil in the second. When all the plants (about 900) on half a field under tobacco for 20 years were inoculated with mosaic in the autumn of 1930, and the stalks cut up and returned the following spring, 9·3 per cent. mosaic developed in the infested half and 3·4 per cent. in the uninfested. In the autumn of 1931, half the plants on the infested side were inoculated with yellow tobacco mosaic and the remainder with green [ibid., xi, p. 750], while all mosaic plants were removed from the other side of the field. The stalks of both yellow and green mosaic plants were cut up and returned to the infested half of the field before setting in 1932. At topping time, there was 1·8 per cent. mosaic on the uninfested and 16 per cent. on the infested side, both the yellow and green forms being represented. The former was observed nowhere else on the farm, indicating that it, like green mosaic, originated either from overwintering roots or from the stalks added to the soil. Green mosaic was about five times as prevalent as yellow. Greenhouse tobacco plants rubbed with mud from the infested half of the field and placed in infested soil contracted both types of mosaic in the late winter and spring of 1932. Infection was artificially induced on Turkish tobacco by rubbing the roots with, or dipping their cut ends into, a mosaic decoction, the incubation period for both green and yellow mosaic being 17 to 40 days.

Judging by the reports of 1,600 farmers on the No. 5 White Burley tobacco variety, this selection is characterized by an exceptionally high degree of resistance to root rot [*Thielaviopsis*

basicola: ibid., xii, p. 146]. Angular leaf spot (*Bacterium angulatum*) developed suddenly in plant beds of White Burley tobacco over an extensive area in the central bluegrass region. The disease was not prevented by double treatment of the seed with silver nitrate, but was completely controlled by one or two sprayings with Bordeaux mixture applied to the seedlings in a bed of 1,300 sq. ft., (1) during the development of the first true leaves, and (2) a fortnight later. *Bact. angulatum* was found to be killed by 10 minutes' exposure to a temperature of 52° C., suggesting that 20 minutes' seed treatment at this degree may be effective. Infection was rarely observed to occur through the upper leaf surfaces in foliage almost mature at the time of inoculation, whereas the very young leaves in an actively growing condition were equally liable to attack on either side. The largest spots were found to develop on the smallest, most tender leaves.

The ascospores of *Sclerotinia trifoliorum* infect red clover [*Trifolium pratense*] plants in the autumn directly through the leaves and petioles [ibid., xi, p. 461]. In a field containing numerous apothecia, the leaflets may be thickly peppered with small, brown spots whence the fungus can readily be isolated. *Sclerotium bataticola* [*Macrophomina phaseoli*] was isolated from red clover rootlets during the winter and summer, and from dead crowns of the same host in the greenhouse and field. The fungus proved mildly pathogenic to clover seedlings. Red clover plants growing next to tobacco affected by yellow ring spot [ibid., xii, p. 471] contracted a closely similar disease.

Botany.—*ex* Work of the Agricultural Experiment Station. Report of the Director for the year ending June 30, 1932.— *Missouri Agric. Exper. Stat. Bull.* 328, pp. 25–26, 1933.

The following items of phytopathological interest are contributed by C. M. Tucker. Loose smut of barley [*Ustilago nuda*] was entirely eliminated by X-ray radiation at a dosage of 3,840 *r*, but the treatment led to a serious decline of germination.

Surveys revealed the presence of flag smut of wheat [*Urocystis tritici*: ibid., ix, p. 167] only in three fields of the Red Wave variety in two counties.

Among the new or uncommon plant diseases reported in the State during 1931–2 were a pink mould of edible mushrooms caused by an undescribed species of *Diplocladium*; a canker of young *Albizzia julibrissin* branches due to *Nectria* sp.; a rot of pepper [*Capsicum annuum*] fruit (*Diaporthe* sp.); *Bacterium gummisudans* on gladiolus [ibid., viii, pp. 22, 382]; branch canker of magnolia (*Diplodia magnoliae*); leaf spot of lucerne (*Thyrospora sarcinaeforme*) [ibid., xi, p. 377]; and *Phytophthora parasitica* causing root rot of rhubarb [cf. ibid., xi, p. 331].

Report on the work of the Plant Protection Section during the period 1925–1931.— *Min. of Agric., Egypt*, 49 pp., 1 graph, 1933.

A short history is given of the work attempted and the results accomplished by the Plant Protection Section of the Egyptian

Ministry of Agriculture during the six-year period 1925–31. Reference to most of the work on fungal and bacterial diseases mentioned (on pp. 35–42) has been made from time to time in this *Review.*

OKABE (N.). **Bacterial diseases of plants occurring in Formosa III.**—*Journ. Soc. Trop. Agric.*, v, 2, pp. 157–166, 4 figs., 1933.

Continuing his investigations on the bacterial diseases of plants in Formosa [*R.A.M.*, xii, p. 554], the writer gives detailed descriptions of the leaf spots of jute (*Corchorus capsularis*) and soy-bean, caused by *Bacterium nakatae* type B and *Bact. sojae* var. *japonicum*, respectively, and of mulberry blight (*Bact. mori*) [ibid., xi, pp. 475, 756].

Bact. nakatae type B produces on jute leaves minute, water-soaked dots, gradually enlarging into translucent, brownish to blackish, irregular spots between the leaf veins, frequently surrounded by a pale yellowish-green halo, 1 to 2 mm. in diameter. The causal organism is a non-acid-fast, aerobic rod with rounded ends, measuring 1·1 to 2·5 by 0·3 to 0·4 μ, occurring singly, in pairs, or short chains, forming capsules on blood serum and potato dextrose agar, furnished with one polar flagellum and producing pseudozoögloeae in liquid media. On beef extract agar plates the colonies are round, smooth, glistening, pale yellow at first, deepening to brown; on slants the final colour is purplish-brown to deep brown. A brown colour is also developed at maturity on most other media. Gelatine is liquefied and milk coagulated; good growth is made in Uschinsky's but not in Cohn's or Fermi's solutions. Dextrose, saccharose, maltose, and lactose are utilized with acid production. Indol is not produced or nitrates reduced.

Fifteen minutes' exposure to sunlight resulted in the almost complete destruction of the cultures, which were also killed in two days in a desiccator. Good growth was made between P_H 5·9 and 7·6, with an optimum near 6·5. The minimum, optimum, and maximum temperatures for growth are 10°, 30° to 32°, and 39° C., respectively, with a thermal death point at 49°. Inoculation tests on jute seedlings with bacterial suspensions gave positive results.

This organism differs from *Bact. nakatae* Takimoto principally in its capacity to form a brown pigment in culture. This character is so distinct that the jute strain may conveniently be designated *Bact. nakatae* type B.

Bact. sojae var. *japonicum* was described (in Japanese) by S. Takimoto (*Journ. Plant Protect.*, xiv, p. 556, 1927) as causing angular or round, pale to blackish-brown spots with pale yellowish-green to mustard-yellow margins, 0·5 to 4 mm. in diameter, on the lower leaves of soy-beans, which finally become ragged owing to the breaking of the infected areas. The organism is a large rod with rounded ends, measuring 1·4 to 5·2 by 0·4 to 0·7 μ (average 2·6 by 0·5 μ) in beef extract agar, occurring singly, in pairs, or in chains and long filaments, motile by 1 to 4 polar flagella, forming glistening white colonies, not liquefying gelatine or coagulating milk, aerobic, Gram-negative, and non-acid-fast. Indol is not produced or nitrates reduced, but slight acid formation occurs in

saccharose and dextrose solutions of peptone water. Growth occurs in Uschinsky's and Fermi's solutions but not in Cohn's. The minimum, optimum, and maximum temperatures for growth are 3°, 25°, and 37°, respectively, with a thermal death point at 47°. Positive results were given by inoculation tests from a beef extract agar culture. A close relationship with *Bact. sojae* [ibid., xi, p. 316] is indicated.

The characters of the bacterium isolated from mulberry (*Morus alba*) blight agree with those of *Bact. mori*.

HAMDI (H.). **Über den sog. Pflanzenkrebs und seine Metastasen und ihre Vergleichung mit den Tiergewächsen.** [On the so-called plant cancer and its metastases and its comparison with animal growths.]—*Virchows Arch.*, cclxxxvii, 1, pp. 29–33, 3 figs., 1932.

For some years the writer has made experimental studies in Constantinople on the crown gall of plants caused by *Bacterium tumefaciens*, chiefly on *Pelargonium* [*zonale*]. In the beginning the gall is composed of an almost mosaic-like arrangement of young, polygonal cells and branched vascular elements, while at maturity it consists of a random distribution of cells and vessels differing from the normal tissues only in the large size of some of the elements.

The neoplasm develops (1) by cell proliferation consequent on the continual stimulus of *Bact. tumefaciens* and not by reason of any inherent capacity in the cells for multiplication; (2) by the abnormal multiplication of the healthy cells surrounding the site of infection; and (3) as a result of the penetration of the bacteria into the intercellular passages and vessels, whereby comparatively remote cells become exposed to the bacterial stimulus causing proliferation. In none of these modes of development is there any true analogy between plant and animal cancers, notwithstanding the superficial resemblances of destruction and extension common to both [*R.A.M.*, xi, p. 562].

The formation of the so-called metastases is effected by the upward migration of the bacteria from the point of inoculation coincident with the growth of the stem. When these detached bacteria remain close together, the resulting metastases often converge or are connected by a strand parallel with the cambium. In the youngest metastases the cells are arranged in arc-shaped rows round the centre of proliferation, otherwise they do not differ from the primary neoplasm, while at maturity the typical cauliflower shape may be assumed. The fairly common development of branches from a gall is attributable primarily to the bacterial stimulus on the cambium.

In metabolism and growth the plant gall is directly dependent on its host, suffering severely and partially disintegrating even with a slight reduction in the food supply and frequently healing spontaneously after three years, when the bacteria lose their virulence. The neoplasm is in no sense injurious to the plant as a whole and neither in its histological nor in its biological functions does it behave as an independent new formation.

IWAYAMA (S.). **On a new snow-rot disease of cereal plants caused by Pythium sp.**—Pamphlet issued by *Agric. Exper. Stat. Toyama-Ken, Japan*, 20 pp., 2 pl., 3 graphs, 1933. [Japanese, with English summary.]

In 1929 a new rot of cereals [species not indicated in the summary] under snow was detected in the Toyama prefecture, Japan. The disease, which is particularly injurious on early sown, heavily manured crops on poorly drained soils under a thick snow canopy, is attributed to a *Pythium*, believed to be probably a new species. The fungus grows well on potato and barley decoction agars, on which it is characterized by pale olive-yellow, granular hyphae, 2·9 to 8·9 μ in diameter (average 6·6 μ), becoming septate when mature; spherical, ellipsoid, oval, lemon-shaped, or irregular, thin-walled, smooth, pale olive-yellow, terminal sporangia, 28 to 48 by 26 to 44 μ on the host, 33 to 39 μ in diameter in culture; flask-shaped intercalary sporangia, 36 to 48 by 24 μ in diameter; spherical, terminal or intercalary oogonia, with a single spherical, pale olive-yellow oospore, 19 to 24 μ (21 μ) in diameter; and clavate antheridia arising from the same hypha as the oogonium or from another one. The optimum temperature for the growth of the fungus on culture media lies between 15° and 18° C. Inoculation experiments consistently gave positive results on cereal plants under snow.

ALLEN (RUTH F.). **Further cytological studies of heterothallism in Puccinia graminis.**—*Journ. Agric. Res.*, xlvii, 1, pp. 1–16, 6 pl., 1933.

After a brief reference to her previous communication on the development of *Puccinia graminis* in the leaf tissues of the European barberry [*R.A.M.*, xi, p. 168], the author gives a detailed account of her studies of the development and ulterior fate of the surface (receptive) hyphae. She found that in young, tender leaf tissue, the gametophytic hyphae push out freely between the epidermal cells to both the upper and lower surfaces of the leaf, and occasionally grow for short distances along the surface; in places where the epidermis is weakened by the tension exerted by the developing spermogonia, the surface hyphae are formed in great abundance. However, as the barberry leaves mature and their outer epidermal walls become thickened, the formation of new surface hyphae is rendered more difficult or prevented, and those that have already emerged between the epidermal cells die and disintegrate. In young infections, hyphae are rarely seen in the stomata (all of which are on the lower side of the barberry leaf), and those that are formed are rapidly killed by the closing of the stoma, but as the infection grows and the host tissues become hypertrophied, the stomata are easily opened and soon fill with hyphae in ever-increasing number.

Under the conditions of the experiments, fertilization of the aecidial primordia commonly occurred through the spermogonia on the upper surface, in some instances this being the only possible means observed for the entrance of the spermatia, which apparently fuse with the paraphyses. When fertilization was prevented, the spermogonia remained active during the whole life of the fungus;

they continued to extend and formed new paraphyses, and the drop of spermogonial exudate was maintained; but a day or two after fertilization, independently of the time at which it occurred, the formation of spermatia was stopped, the exudate dried up, and the spermogonia died. It is believed that fertilization can also take place through the stomatal hyphae on the lower leaf surface, although this was not actually seen. After its formation, the sporophyte spreads from its point of origin to the aecidial primordia. There was some evidence that this is effected in part by migration of nuclei through the existing hyphae.

MONTEMARTINI (L.). **Sopra la ruggine del Frumento in Sicilia.** [On Wheat rust in Sicily.]—*Atti R. Accad. di Sci., Lett. ed Arti, Palermo*, xviii, 16 pp., 1933. [Abs. in *Riv. Pat. Veg.*, xxiii, 5–6, p. 256, 1933.]

In certain coastal areas of Sicily where the climate is marked by a hot, stagnant humidity, wheat is attacked almost every year by *Puccinia triticina* and to a less extent by *P. glumarum*, though in the interior of the island infection is much less frequent. *P. triticina* attacks every variety grown in Sicily, Rossello slightly, Majorca rather more, and Mentana (which on the mainland is considered to be resistant) very severely. There are two periods of greatest susceptibility, one when the ear, still covered by the leaf sheaths, first becomes differentiated, and the other when the grain is ripening.

RADULESCU (E.). **Beiträge zur Kenntnis der Feldresistenz des Weizens gegen Puccinia glumarum tritici.** [Contributions to the knowledge of the resistance of Wheat to *Puccinia glumarum tritici* in the field.]—*Planta*, xx, 2, pp. 244–286, 1 diag., 13 graphs, 1933.

A comprehensive and fully tabulated account is given of the writer's investigations at the Halle (Germany) Agricultural and Plant Breeding Institute on the factors influencing the resistance of wheat to yellow rust (*Puccinia glumarum tritici*) in the field.

The functional connexion between resistance and the slow opening of the stomata in the early hours of the morning suggested by Helen Hart [*R.A.M.*, ix, p. 295] was not confirmed in the writer's experiments, which showed that the rate of stomatal opening depended primarily on the amount of light accessible to the plants, the stomata of a given variety in shadow opening later than those of plants directly exposed to the sun. Stomatal movement was further shown to be influenced by manuring, nitrogen exerting a retarding action on the process while potash stimulates it. Of the 144 winter and summer wheat varieties and 87 progenies of crosses studied over a two-year period for their reaction to yellow rust, ten of the winter and four of the summer varieties proved uniformly resistant, viz., (1) Criewener 104, Fürst Hatzfeld, Hohenheimer 77, Krafft's Siegerländer, Krafft's Dickkopf, Kirsche's Stahl, Rimpau's Hybrid, Ridit, General v. Stocken, and Struy; (2) Grüne Dame, Hohenheimer 25 f., v. Rümker's Sommer-Dickkopf, and

Strube's roter Schlanstedter [cf. ibid., xii, p. 273]. These varieties, however, showed considerable discrepancies with regard to the rate and extent of stomatal opening, which were found to be heritable characters. Other varieties with a uniform rate of stomatal opening were resistant in one season and not in another, the variation from season to season being probably correlated with temperature differences. The writer's experiments do not indicate that stomatal behaviour alone can be used as a criterion of resistance to rust [ibid., xi, p. 439].

STEINER (H.). **Über die Braunrost- (Puccinia triticina und Puccinia dispersa) Anfälligkeit von reziproken Bastarden zwischen Weizen und Roggen.** [On the brown rust (*Puccinia triticina* and *Puccinia dispersa*) susceptibility of reciprocal hybrids between Wheat and Rye.]—*Der Züchter*, v, 2, pp. 179–180, 1933.

A seedling hybrid representing one variety of wheat (Bokhara) and four of rye (Heinrich, Hanna, Fischer, and Sturm) was inoculated in a glasshouse at the Vienna Institute of Agronomy with the uredospores of the wheat and rye brown rusts (*Puccinia triticina* and *P. dispersa* [*P. secalina*]), and proved to be susceptible to the former and resistant to, or immune from the latter. Similar results were obtained with the reciprocal rye-wheat hybrid.

YU (T. F.), CHEN (H. K.), & HWANG (L.). **Varietal resistance and susceptibility of Wheats to flag smut (Urocystis tritici Koern.)**—*Nanking Journ.*, iii, pp. 217–234, 1933.

A fully tabulated account is given of experiments conducted at Nanking, China, from 1925–32, inclusive, on the reaction to flag smut (*Urocystis tritici*) of a large number of native and foreign wheat varieties [*R.A.M.*, xii, p. 363]. The tests were made by shaking the seed-grain and spores together until thoroughly mixed and sowing at the ordinary time in the autumn. The control showed from 16 to 53 per cent. infection in different seasons from 1927 onwards. Of the 138 American varieties and strains (out of a total of 472 tested) that remained free from infection throughout the trials, special promise as regards adaptability to local conditions was shown by three, viz., Red Rock, Mindum, and Quality. The most satisfactory of the 13 German varieties was Carstens Squarehead (free from smut for seven years). Of the four Canadian varieties, Dawson's Golden Chaff and Marquis maintained freedom from infection for five years, during which period only two of the 21 Australian varieties (Nebawa and Rajah) remained immune from the disease. Only one of the 136 Chinese wheats used in the tests showed no smut during the whole period, namely, Nanking No. 16, but three collections, Kaifeng 22 and 52 and N. 590 showed a low percentage of infection in the first year only.

It is apparent from these data that, in general, foreign wheat varieties, though later maturing, are more resistant to flag smut than those indigenous to China.

MUNERATI (O.). **È possibile separare delle comuni varietà di Grano razze o linee resistenti alla carie?** [Is it possible to isolate in common Wheat varieties, races, or lines resistant to bunt?]—*Italia Agric.*, pp. 25–27, 1933. [Abs. in *Riv. Pat. Veg.*, xxiii, 5–6, pp. 273–274, 1933.]

From artificial infection experiments conducted over a period of three years with seed from 2,800 Gentil rosso and an equal number of Ardito wheat plants which the year before had remained unaffected by bunt [*Tilletia caries* and *T. foetens*] the author concludes that neither variety contains lines or races resistant to the disease.

BRIGGS (F. N.). **A third genetic factor for resistance to bunt, Tilletia tritici, in Wheat hybrids.**—*Journ. of Genetics*, xxvii, 3, pp. 435–441, 3 graphs, 1933.

The detection of a factor for resistance to wheat bunt (*Tilletia tritici*) [*T. caries*] in Turkey wheat in California, the genetical evidence for which is given in this paper [*R.A.M.*, xi, p. 500], adds a third to the Martin and Hussar factors previously investigated [ibid., xii, pp. 84, 155]. The new Turkey factor approximates to Hussar in its relative dominance, as compared with the absolute dominance of Martin, bunt in the two former varieties developing on about half or less of the heterozygous plants. The three factors under observation should serve to differentiate eight physiologic forms of *T. caries* [cf. ibid., xii, p. 617]. J. G. Churchward has found that the resistance to bunt of Florence wheat in New South Wales is due to a single recessive factor [ibid., xii, p. 85], which must be distinct from the three mentioned above.

STIELTJES (D.). **Dilophospora-ziekte van granen en grassen.** [The *Dilophospora* disease of grains and grasses.]—*Tijdschr. over Plantenziekten*, xxxix, 8, pp. 200–206, 3 pl., 1933.

Following the observation in 1931 and 1932 of an attack on oat crops by *Dilophospora graminis* [*D. alopecuri*: *R.A.M.*, xi, p. 767] in the absence of eelworms (*Tylenchus tritici*), the author sowed rye, wheat, oats, and some twenty grasses on an affected plot, the seed-grain being mixed with a few diseased oat grains. Oats in the experimental plot contracted infection by *D. alopecuri* to a varying extent, rye was very slightly attacked, and wheat remained completely immune. Infection was also observed on *Avena elatior*, *Holcus lanatus*, and *Agrostis spica-venti*. No trace of *T. tritici* was found in the infected plants.

In oats, the upper part of the plant becomes abnormally thick and the plume, enveloped by the sheath of the last leaf, cannot free itself from the sheath of the penultimate leaf. Between these two leaf sheaths, and between the last leaf and the plume is a white mass of mycelium which surrounds and destroys the flowers. Later, both leaves and leaf sheaths develop well-defined, yellowish-white spots, while in some cases the whole of the last leaf may turn yellowish-white with a dry, dead tip which is caught within the next leaf sheath. The pycnidia of the fungus develop in immense numbers on the lesions. In milder attacks the plume

succeeds in partially rupturing the enclosing leaf sheath, the basal portion, however, generally being killed and disintegrating into a brownish-black mass. On breaking open the leaf sheath of a diseased plant left for some little time in a damp atmosphere, the remnants of the glumes may generally be discerned, but the site of the flowers is occupied by a thick, felt-like mass of hyphae, already beginning to turn brown.

In the above-mentioned susceptible grasses the symptoms are as described for oats, but in rye the ear usually develops normally except in very severe cases, when it remains enveloped in the uppermost leaf sheath. Affected rye plants remain abnormally short owing to the stunting of the top node.

This is believed to be the first record of *D. alopecuri* on oats, the spore measurements on which agree entirely with those given by Atanasoff. The spread of the disease in the Meppel district of Holland, where these observations were made, is, no doubt, due, as in Germany [ibid., viii, p. 300], to the use of infected seed. The resistance of wheat and various grasses to the local strain of the fungus seems to point to the existence of biologic forms of *D. alopecuri.*

Bockmann (H.). **Die Schwärzepilze des Getreides unter besonderer Berücksichtigung ihrer Pathogenität und des Vorkommens von Rassen innerhalb der Gattungen Cladosporium Link und Alternaria Nees.** [The blackening fungi of cereals with special reference to their pathogenicity and the occurrence of strains within the genera *Cladosporium* Link and *Alternaria* Nees.]—*Angew. Bot.*, xv, 3, pp. 308–321; 4, pp. 329–385, 9 figs., 2 graphs, 1933.

The so-called 'blackening' disease of cereals, characterized by an overgrowth with olive-green to black mycelia of various fungi on any of the plant organs, was studied on cereal specimens collected in Schleswig-Holstein during 1930–1 and infected by different strains of *Cladosporium herbarum* (wheat, spelt, rye, barley, and oats), *Alternaria tenuis* (wheat and oats), *A. peglionii* [*R.A.M.*, v, p. 663] (wheat, oats, rye, and barley), and *A. circinans* [see above, p. 3].

The cultural and morphological characters of representative strains of *C. herbarum* are described. The conidiophores of the *Cladosporium* forms differed widely from those of the *Hormodendrum* type, to which some of the strains approximated [ibid., vii, p. 709]. In the former, the number of conidia formed by a conidiophore did not exceed 50, whereas in those of *Hormodendrum* 200 to 300 may be found. The minimum conidial length of four *Cladosporium* strains (mean of 200) was 8·99 ± 0·23014 μ and the maximum 9·45 ± 0·20581 μ, the corresponding dimensions for four *Hormodendrum* strains being 5·46 ± 0·15135 μ and 6·58 ± 0·26089 μ, respectively; the minimum and maximum widths for the former group were 4·63 ± 0·07307 μ and 4·83 ± 0·070097 μ, and for the latter 2·98 ± 0·042989 μ and 3·14 ± 0·04028 μ.

On the particularly favourable maltyl-liebig-agar medium it was possible to classify all the strains according to their colour, which was greyish-green in the case of *C. herbarum* and yellowish-green

in that of *H. cladosporioides*. A comparison of the growth rates of several strains on potassium and ammonium salts indicated that the former tend to stimulate and the latter to depress growth. Two *Cladosporium* and three *Hormodendrum* strains made good growth at P_H 5·6, 6·4, 7·2, and 8·0, with a tendency to more vigorous development towards the alkaline side. The optimum temperature for growth was found to be 26° C., with a minimum at −2° and maximum at 33°. The *Hormodendrum* strains were much more active in the decomposition of albumin than those of *Cladosporium*. Seven strains of the latter dissolved starch and disintegrated pectin.

Discussing the problem of polymorphism in *C. herbarum* and *H. cladosporioides*, the writer finds no evidence for its existence in the sense of alternating development of the two spore forms. The development of *Hormodendrum* sectors in *Cladosporium* colonies, occasionally observed by him, is not regarded as an indication of polymorphism, being equally well explicable as a vegetative modification. The differences between the *Cladosporium* and *Hormodendrum* groups scarcely justify the establishment of two distinct species. For the present *C. herbarum* should rank as a collective species.

The *Alternaria* strains were investigated on the same lines as *C. herbarum*. On maltyl-liebig-agar the mean conidial dimensions of *A. tenuis* (from oats) were found to be 28·37 ± 0·51399 by 10·34 ± 0·14182 μ, for *A. peglionii* (barley) 24·69 ± 0·47838 by 11·08 ± 0·14304 μ, and for *A. circinans* (wheat) 40·78 ± 1·1187 by 12·20 ± 0·17116 μ. The conidia of *A. peglionii* are light brown and of very irregular shape, sometimes markedly piriform with an elongated isthmus joining two spores. *A. tenuis* is characterized by olive-green to brown conidia of regular form with a very short but well-defined isthmus. In *A. circinans* the conidia are olive-green to brown, elongated, and pluriseptate. Potassium and ammonium salts affected growth in the same way as with *C. herbarum*. The optimum temperature for development was found to be 26°.

The writer has never detected the blackening fungi in the field except on tissues already destroyed by other agencies. Inoculation experiments with *C. herbarum* on wheat seed-grain definitely showed that this fungus is not concerned in the black discoloration of foot-rotted plants. Tests with various strains of the same fungus on wounded and unwounded wheat, barley, oats, and rye leaves gave consistently negative results, even at low temperatures (1° to 5°). In order to determine the part played by *C. herbarum* in the development of the disorder known as 'black point' in the United States, 'puntatura' in Italy, 'mouchetage' [or 'moucheture'] in France [ibid., x, p. 21], and 'dark' or 'brown tip' in Germany (*Landw. Jahrb.*, xxiii, p. 969, 1894), the writer inoculated a strain of the fungus into milk-ripe wheat and barley seeds (40 of each) in Petri dishes. Infection was contracted by 37 wheat and 20 barley seeds, the mycelium penetrating the pericarp and spreading from cell to cell through the pits. The endosperm and embryo were not invaded and there was no brown discoloration of the tissue as in black point, so that *C. herbarum* can scarcely be

considered as a cause of this trouble. This fungus indeed seems only able to grow in dead tissues and is evidently a saprophyte in Münch's sense [*R.A.M.*, ix, p. 47].

Similar inoculation experiments with *A. peglionii* (17 strains) failed to cause foot rot of wheat, but local discolorations developed where the hyphae had attempted to enter the cells, their progress being checked by a cellulose sheath [ibid., iii, p. 82; xi, p. 708]. *A. tenuis* was found to be capable of the active destruction of living leaf tissue of all four cereals, but produces only microscopic symptoms, and must therefore be regarded as a true perthophyte. Barley and oats are more susceptible than wheat and rye. Neither *A. tenuis* nor *A. peglionii* succeeded in penetrating the testa of wheat and barley seeds, though in a few cases the presence of a cellulose sheath indicated attempted entry. The rôle of these fungi in the etiology of black point is similar to that of *C. herbarum*. The blackening fungi are of little economic importance except as tending to lower the market value of the seed-grain.

SCHMIDT (E. W.) & FEISTRITZER (W.). **Beiträge zur Fusskrankheit des Getreides und ihrer Bekämpfung.** [Contributions to the foot rot of cereals and its control.]—*Arch. für Pflanzenbau*, A, x, 3, pp. 391–421, 1 diag., 1 graph, 1933.

In this further account of investigations at Kleinwanzleben, Germany, on the foot rot of cereals predominantly associated with *Fusarium culmorum* [*R.A.M.*, xii, p. 157], the writers again note the beneficial effects on barley and wheat of ploughing under the stubble to a depth of 24, or preferably 34 cm. In a test with winter wheat it was found that late sowing (mid-November to early December) reduced the incidence of infection, but under such conditions tillering and ear weight simultaneously declined, especially in Rimpau's Hybrid, necessitating the use of larger quantities of seed-grain. No intensification of infection resulted from the ploughing under of diseased stubble. The amount of foot rot was increased by applications of stable manure (200 doppelzentner per hect.) and *F. culmorum* was isolated from the manure heaps. The disease was less severe in stands sprayed with sulphuric acid at the rate of 20·6 doppelzentner per hect., but spring applications of kaolin (40, 100, or 400 gm. per sq. m.) proved ineffectual.

F. culmorum was found to occur in a viable condition in the soil to a depth of 50 cm.

TANJA (ANNA E.). **Untersuchungen über Gibberella saubinetii (Dur. et Mont.) Sacc. und die Fusariose des Weizens.** [Investigations on *Gibberella saubinetii* (Dur. et Mont.) Sacc. and the fusariosis of Wheat.]—*Phytopath. Zeitschr.*, vi, 4, pp. 375–428, 1 fig., 5 diags., 21 graphs, 1933.

The hydrogen-ion concentration of a modified Richards's solution was changed from P_H 4·05 and P_H 6·06 to a point beyond neutrality in two instances by the growth of three strains of *Gibberella saubinetii* from the Centraalbureau voor Schimmelcultures, originally isolated by Wollenweber, F. T. Bennett [*R.A.M.*, x, p. 783], and Harter. At P_H 2·8 the growth of the strains was poor, at 4·05 the optimum (expressed in terms of dry weight) was

reached, with a gradual decline at 6·06 and a very small growth at 7·02. The minimum temperature for the development of the three strains of *G. saubinetii* was just below 6° C., that for *Fusarium culmorum* [ibid., xii, p. 502] being 9°. Bennett's strain of *G. saubinetii* developed best at 30°, Wollenweber's and *F. culmorum* at 27°, while the range of Harter's strain was fairly wide (21° to 30°); the maximum for all four lay round about 36° [cf. ibid., xii, p. 621].

The germinative capacity of two wheat varieties, the Swiss Plantahof and the American Marquis (both supplied by the Federal Agricultural Experiment Station, Oerlikon-Zürich), was determined at varying temperatures. The optimum (98 per cent.) for Plantahof was found to be 18° with a fairly satisfactory germination percentage between 6° and 35°. Marquis germinated best (92 per cent.) at 15° with a rapid decline in the number of seedlings at both higher and lower temperatures. Both varieties suffer more severely from *G. saubinetii* and *F. culmorum* at high than at low temperatures, the attacks of the former being particularly virulent under dry conditions. Plantahof showed a higher degree of resistance to *G. saubinetii* and *F. culmorum* than did Marquis. Bennett's strain of *G. saubinetii* was the most virulent of the three tested and Harter's the least, Wollenweber's and *F. culmorum* being intermediate.

A three-page bibliography is appended.

HEWLETT (C. H.) & HEWLETT (M. A.). **Hot-water treatment of seed Barley.**—*New Zealand Journ. of Agric.*, xlvii, 1, pp. 33–37, 1933.

In 1933, twenty-six growers in the Canterbury district of New Zealand again persisted in using their own barley seed instead of the pure strains free from smut [*Ustilago hordei* and *U. nuda*: *R.A.M.*, xi, pp. 505, 776] available to them. The result was that while the product of the treated seed was 38·9, 23·2, and 37·9 per cent. grades 1, 2, and 3, respectively, the corresponding figures for that of the untreated seed were 26·6, 28·5, and 44·9 per cent.

The average yield obtained from the grower's own seed was no less than 5·2 bushels per acre less than that from the treated seed, the total reduction in yield and grade representing a value of 17*s.* 8*d.* per acre, or £1 1*s.* 9*d.* per acre if the 'mill seconds' are included.

YU (T. F.) & CHEN (H. K.). **Seed treatments for controlling stripe disease of hulless Barley.**—*Nanking Journ.*, iii, pp. 237–242, 1933.

Further experiments (1927–9) in the control of barley stripe [*Helminthosporium gramineum*] in the Nanking district of China [*R.A.M.*, ix, p. 29] showed that none of the dusts tested (copper carbonate, uspulun, tillantin, and tillantin B) was fully effective against this disease, though all reduced its incidence. Used in liquid form, uspulun and tillantin (0·3 per cent., one or two hours' immersion of the seed-grain) gave better control than the dusts and in some cases entirely eliminated infection.

Yu (T. F.) & Chen (H. K.). **Treatment of hulless Oat to prevent covered smut [Ustilago levis (Kell. & Sw.) Magn.].**—*Nanking Journ.*, iii, pp. 235–236, 1933.

The results of two years' experiments at Nanking, China, demonstrated the efficacy of copper carbonate and tillantin B dusts (4 oz. per bushel) in the control of covered smut of hull-less oats (*Ustilago levis* [*U. kolleri*]).

Fawcett (H. S.). **New locations for Phytophthora citrophthora and P. hibernalis on Citrus.**—*Phytopath.*, xxiii, 8, pp. 667–669, 1933.

Phytophthora citrophthora was isolated from decayed oranges and grapefruit in Florida, and from the former host in Louisiana in 1932, while *P. parasitica* was found on oranges in Florida [*R.A.M.*, xii, pp. 368, 565], the determinations being confirmed by S. F. Ashby. This appears to be the first record of the occurrence of *P. citrophthora* in Florida, where *P. parasitica* was previously known on grapefruit. *P. hibernalis* [ibid., xii, p. 212] (also identified by S. F. Ashby) was isolated from rotting oranges in California in 1932, this being apparently the first definite record of the fungus in the United States. The writer is now of opinion, however, that an organism isolated in previous years from Californian citrus fruits was actually *P. hibernalis*, the extreme intolerance of which to the high temperatures prevailing in the late spring and summer has hitherto tended to prevent its investigation. Recently Ashby has determined a species isolated from citrus roots in California as probably *P. megasperma* [ibid., xi, p. 303].

[Nattrass (R. M.).] **Gummosis of Citrus trees.**—*Cyprus Agric. Journ.*, xxviii, 2, pp. 49–52, 2 figs., 1933.

After stating that in most of the old-established citrus groves in Cyprus gummosis [*Phytophthora citrophthora*: *R.A.M.*, xii, p. 368] of the main root, collar, and trunk is favoured by the use of the old basin system of irrigation, which leaves the tree in a standing pool of water, the author indicates a method (for use when the furrow system of irrigation between the rows is impracticable) of remedying this by laying bare the roots for about 2 ft. and making a parapet of the earth removed in the process between the trunk and the basin.

Of the citrus varieties locally grown the lemon is the most susceptible, followed by sweet lime (*Citrus aurantifolia*), hitherto commonly used as a stock. With the distribution of resistant bitter orange (*C. aurantium*) [var. *bigaradia*] stock by the Horticultural Department little trouble from gummosis is to be expected in the new groves. As, however, the ordinary Jaffa orange scion is also susceptible the union should not be made nearer than 8 in. to the ground, and young trees budded in nursery beds should be planted no deeper in the groves than in the nursery.

Notes are given on the treatment of affected trees by surgical methods, 'inarching' (i.e., planting resistant stocks round the tree,

the tops being grafted into the trunk above the injury), and 'bridge grafting' when the base of the scion has become infected.

WINSTON (J. H.). **Some factors influencing decay in Florida Citrus fruits.**—*Citrus Industry*, xiv, 5, pp. 20, 24, 1933. [Abs. in *Hort. Abstracts*, Imper. Bureau of Fruit Production, iii, 3, p. 136, 1933.]

Citrus fruits in Florida are stated to be specially liable to decay by two stem-end rots [*Diplodia natalensis* and *Diaporthe citri*: *R.A.M.*, xi, p. 771; xii, pp. 213, 495]. The factors contributing to this form of decay are discussed under two headings, viz., pre-harvest, and harvesting and post-harvest. Dead wood in the trees is the sole known source of infection by *Diplodia*. Contrary to popular belief, early harvested fruit decays much more slowly than that picked later. Fruit sprayed with the less volatile types of oil within a month of picking requires a longer time in the colouring room, whereby the amount of decay is increased. Fruit from trees to which ammoniate fertilizers are applied in excess readily bruises and decays. Fruit on rough lemon rootstocks is particularly susceptible to stem-end rots. The factors promoting infection at and after harvest include careless dipping; over-filling field boxes; failure to use borax in the washing operations, when it is much more effective against stem-end rots than after colouring [cf. ibid., viii, p. 378]; faulty handling in the colouring room; and delay between picking and pre-cooling.

LINDERMAN (R. H.). **A spray programme for Citrus trees.**—*Citrus Industry*, xiv, 5, p. 6, 1933. [Abs. in *Hort. Abstracts*, Imper. Bureau of Fruit Production, iii, 3, p. 137, 1933.]

In addition to its insecticidal efficacy, the spraying schedule in force at Mountain Lake, Florida, is claimed to have reduced the incidence of melanose [*Diaporthe citri*: see preceding abstract] below the degree prevalent in neighbouring orchards while improving the colour and texture of the fruits. A first application of lime-sulphur is given in mid-January (1:25 for grapefruit and 1:40 for oranges) and is further stated to effect considerable control of scab [*Sporotrichum citri*]. Dry lime-sulphur may also be used, 2 lb. equalling 1 gall. of solution. The second application (1:40) is made when three-quarters of the blossom has fallen, followed by treatments at the same strength every seven weeks until 1st September, after which one more application suffices to maintain the fruit in good condition until the harvest. A spray pressure of 400 to 500 lb. is used.

L'anthracnose des Aurantiacées Colletotrichum gloeosporioides Penz. (Deuteromycetae, Melanconiae). [Anthracnose of Aurantiaceae, *Colletotrichum gloeosporioides* Penz. (Deuteromycetae, Melanconiae).]—*Direct. Gén. Agric., Comm. et Colon., Service Défense Véget., Mém.* 12, 6 pp., 1 pl., 1933.

Notes are given in popular terms on the symptoms, etiology, and control of citrus anthracnose (*Colletotrichum gloeosporioides*) in Morocco.

BARGER (W. R.). **Water-glass helps to control mold of Oranges.**— *California Citrograph*, xviii, 9, pp. 240, 256, 3 graphs, 1933.

In tests conducted in California in 1927–8 Valencia and Navel oranges, on some of which various types of commonly experienced surface injury had been experimentally reproduced, were dipped into water containing oranges affected with mould [*Penicillium digitatum* and *P. italicum*], allowed to dry, and then immersed for 4 minutes in a 4 to 5 per cent. solution of sodium borates in water or in a 2 to 6 per cent. solution of concentrated water-glass (sodium silicate) stock solution in water, each held at 100° F. and containing a suspension of the spores; control fruits, some of which were also experimentally injured, were similarly inoculated and placed in water at 100° for 3 minutes. The fruit was then dried, wrapped, boxed, and stored at room temperature under a tarpaulin.

Two weeks after treatment the average amounts of decay induced by all the types of injury on the Valencia oranges were about 58, 36, and 90 per cent., for the water-glass, borax, and control treatments, respectively, the corresponding figures for the Navel oranges being about 86, 82, and 96 per cent.; four weeks after treatment the decay figures for the Valencias were about 76, 84, and 97 per cent., respectively, while three weeks after treatment those for the Navel oranges were about 93, 90, and 99 per cent. With fruit not experimentally injured the water-glass treatment, though giving less effective control than borax, reduced decay by nearly one-half for two weeks after treatment and by one-quarter to one-third during a period of four weeks after treatment.

Miscellaneous decay caused mainly by *Colletotrichum* and *Alternaria* was not reduced by either treatment.

On the experimentally injured, borax-treated fruit *P. digitatum* was almost completely controlled, though deep-seated infection by this fungus before picking may not be reached by the solution. Decay following treatment by water-glass was due almost entirely to *P. digitatum*.

In other tests with Navel oranges a 2 per cent. solution of water-glass gave better results than stronger ones.

Over 80 per cent. of the decay in the experimentally injured fruits developed within two weeks of picking and treating, whereas only 30 to 60 per cent. of the decay in the fruit with only old natural injuries developed in the same period. This demonstrates the need of care in picking and handling fruit even when it is to be treated.

WARDLAW (C. W.) & MCGUIRE (L. P.). **Preliminary observations on the storage of Limes, with a note on the King Orange.**— *Trop. Agriculture*, x, 7, pp. 190–191, 1933.

In preliminary storage trials [which are described] at the Low Temperature Station, Trinidad, unwrapped, relatively immature or slightly yellow West Indian limes [*Citrus aurantifolia*] kept at 45° F. for 20 days developed only 4 per cent. fungal wastage, all due to *Penicillium italicum*. Eighty-eight per cent. of the fruits were sound, and eight per cent. were rejected because of external desiccation. It is concluded that the West Indian lime, if carefully

wrapped and suitably crated, possesses good keeping qualities when held at 45°.

Severe tests with the King orange or giant mandarin (a variety of *C. nobilis*) demonstrated that no difficulty need be anticipated in the refrigerated transport and storage of this attractive-looking fruit, provided it is picked when fully grown but still green or only slightly coloured at the stylar end.

STAHEL (G.). **Zur Kenntnis der Siebröhrenkrankheit (Phloëmnekrose) des Kaffeebaumes in Surinam. III.** [Contribution to the knowledge of the sieve-tube disease (phloem necrosis) of the Coffee tree in Surinam. III.]—*Phytopath. Zeitschr.*, vi, 4, pp. 335–357, 12 figs., 1933.

The writer's and H. G. Bünzli's descriptions of the external symptoms of phloem necrosis of coffee trees in Surinam [*R.A.M.*, xii, p. 435] are briefly recapitulated, and full details are given of a further series of inoculation experiments conducted in 1932.

A 28-year-old Liberian coffee tree showed in the soft bast of the root eight rows of sieve-tubes that had undergone multiple division, of which the three outermost were necrotic, while the next two were still living and full of minute flagellates (*Phytomonas leptovasorum*), none of which could be found in the three youngest rows. The whole tree was dug out and the root material (in pieces about 20 cm. in length) used for grafting on the roots of twelve healthy eight-year-old trees, in close proximity to which ten other trees were similarly treated with healthy roots. Six months after grafting all the trees to which diseased material was applied showed definite external symptoms of phloem necrosis and all died a few months later, whereas the ten controls remained healthy. Before the symptoms were obvious 23 twelve-year-old healthy trees were similarly treated with roots from the previously inoculated plants, and of these, nine contracted the disease.

On 30th December, 1930, necrotic root material was grafted on to a twelve-year-old tree, roots from which were grafted in the following May on to two neighbouring trees, with positive results in one case. In July roots from the last-named were applied to three more trees, two of which contracted phloem necrosis. The roots of one of these trees were grafted in October on to two 28-year-old trees, both of which developed the disease in an acute form.

Negative results were given by the transplantation of fragments of the root and stem cortex from diseased to healthy trees, and also by grafting on the latter, portions of branches, 1½ to 2 cm. thick, known to contain flagellates. The examination of the branches used for grafting showed that the flagellates rapidly disappear after the branch is cut, whether the graft takes or not.

All attempts to culture *P. leptovasorum* have hitherto been unsuccessful.

Detailed observations on the dissemination of the flagellates in the soft bast of a number of infected trees revealed important differences between the chronic and the acute forms of phloem necrosis. In the former type the sieve-tubes occupied by the flagellates may function for weeks after invasion, so that the

metabolic products of the protozoa can gradually permeate the entire tree and the symptoms may be, in part, due to a toxic action of these. Food transport is apparently possible even after the multiple division of the sieve-tubes. In acute attacks the flagellates penetrate the sieve-tubes in great numbers and rapidly spread through the root system to the stem, covering apparently a distance of up to 240 cm. within a fortnight. In the stem the sieve-tubes are killed and the phloem parenchyma forms hypertrophied or callus-like tissue in which the groups of collapsed sieve-tubes are embedded. The cambium becomes inactivated and the food-transporting mechanism is destroyed. In such cases the slender rootlets soon die of starvation, and with the onset of dry weather rapid wilting takes place.

MÉTALNIKOV (S. S.). **Action des rayons solaires sur les spores de bactéries pathogènes pour les insectes.** [The action of solar rays on the spores of bacteria pathogenic to insects.]—*Comptes rendus Soc. de Biol.*, cxii, 16, pp. 1666–1669, 1933.

Experiments were carried out in Egypt in 1932 to determine the resistance of certain bacteria of proved pathogenicity to the pink boll worm of cotton (*Gelechia gossypiella*) to the solar rays (1) in June with minimum, mean, and maximum temperatures of 14°, 27°, and 56° C., and (2) towards the end of the summer (18°, 23°, and 40°, respectively). The organisms used were *Bacterium* Cazaubon (isolated in 1930 from the caterpillars of *Pyrausta nubilalis*) [cf. *R.A.M.*, viii, p. 309] and *Bact. ephestiae* No. 1 (isolated in 1931 in Egypt during an epizootic of *Ephestia kuehniella*). The ground cultures (100 mg. of each organism) were exposed to the sun's rays in Petri dishes for periods of 4 or 10 days in the early tests and 6 and 20 days in the late ones, after which bacterial emulsions were prepared, partly for injection into the boll worms and the rest for spraying on cotton, on which 10 to 15 caterpillars were placed after 15 minutes and allowed to feed.

In the June experiments the periods required for the Cazaubon organism to kill the boll worms by injection after 4 and 10 hours' exposure to the sun's rays were 5 and 14 hours, respectively, compared with 3 hours for the unilluminated controls. Applied *per os*, the bacterium destroyed 9 out of 10 insects in 20½ and 23 hours after 4 and 10 hours' radiation, respectively, compared with 18 hours for the untreated controls. *Bact. ephestiae* No. 1 destroyed the boll worms by injection in 3 and 8 hours, respectively, after 4 and 10 hours' exposure to the sun, compared with 2 hours for the control, the corresponding times for oral administration being 9, 27, and 7 hours, respectively. In the late summer (20th September to 10th October) tests, the Cazaubon organism killed the controls in 4 hours after injection, compared with 6 to 9 hours 35 minutes after various periods of exposure to the sun, the respective periods when applied *per os* being 18 and 18 to 26 hours.

It is apparent from these data that the spores of the bacteria Cazaubon and *ephestiae* No. 1 undergo only a very slight diminution of their vitality and virulence even after comparatively lengthy exposures to the solar rays.

MÉTALNIKOV (S.) & MÉTALNIKOV (S. S.). **Utilisation des bactéries dans la lutte contre les insectes nuisibles aux Cotonniers.** [The utilization of bacteria in the campaign against insect pests of Cotton.]—*Comptes rendus Soc. de Biol.*, cxiii, 18, pp. 169–172, 1933.

As a sequel to the laboratory tests with three bacterial organisms pathogenic to the pink boll worm of cotton (*Gelechia gossypiella*), viz., *Bacterium* Cazaubon, *Bact. ephestiae*, and *Bact. gelechiae* No. 5 [see preceding abstract], the writers conducted a series of field experiments at Gizeh, near Cairo, on 42 plots each measuring 22·5 sq. m. and containing some 250 plants, over which a bacterial emulsion (2·5 to 10 gm. per l. with 4 per cent. molasses) was sprayed twice to four times at regular intervals from the first appearance of the insects.

The best results were secured with *Bact. ephestiae*, which reduced the incidence of infestation by 50 per cent. (average of four plots), while the Cazaubon organism was almost equally effective in two plots. *Bact. gelechiae* was less efficacious (as in the laboratory tests), with a reduction of infestation amounting to under 40 per cent. in two plots. The spread of the bacteria outside the limits of the treated areas was shown by the low degree of infestation in the fields adjoining the experimental plots.

Considering the great technical difficulties of the treatment and the excessively heavy infestation in the control plots (nearly 7 boll worm caterpillars per capsule on an average), these results may be regarded as decidedly encouraging, especially as the average reduction in four plots treated with an arsenical solution was only 18 per cent.

SMITH (L. M.). **Coccidioidal granuloma. Report of a case originating in western Texas.**—*Arch. of Dermatol.*, xxviii, 2, pp. 175–181, 5 figs., 1933.

A report is given of a case of human coccidioidal granuloma, in which *Coccidioides immitis* [*R.A.M.*, xii, p. 692] was found in Texas, where the disease was not previously known. The low degree of contagion in the disease is explained by the rapid death of the spores (within five minutes) on drying.

MOCCHI (G.). **Un nuovo caso di haplografiosi.** [A new case of haplographiosis.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, iv, pp. 63–67, 2 figs., 1933. [Latin summary.]

In giving a few clinical notes on a case of ulceration of the skin on the face of a man, observed in 1931 in Pavia, the author states that cultural studies of the organism isolated from the lesion showed it to be *Haplographium de bellae-marengoi* [cf. *R.A.M.*, iii, p. 290], giving further evidence of the pathogenicity to man of this fungus. The lesion did not yield to any of the treatments tested, unlike previous experience with similar cases.

VERONA (O.). **Sul marciume del colletto dei Garofani.** [On basal rot of Carnations.]—*Boll. R. Ist. Sup. Agr. di Pisa*, viii, pp. 451–455, 1932.

Carnations at Pescia affected with basal rot showed the presence

of *Fusarium herbarum*, and inoculations with pure cultures isolated from the plants reproduced the disease, which has hitherto been attributed to *F. dianthi* [*R.A.M.*, viii, p. 788; x, p. 245].

Control consists in replanting and soil disinfection with formaldehyde solution (1 in 300) applied at the rate of 10 to 12 l. per sq. m. As a preventive, a dust composed of iron sulphate and quicklime in equal parts may be applied to the foot of healthy or very slightly affected plants.

HARRIS (M. R.). **A Phytophthora disease of Snapdragons.**—*Science*, N.S., lxxviii, 2016, p. 152, 1933.

Phytophthora (?) *cactorum*, isolated in 1932 from wilted greenhouse snapdragons [*Antirrhinum majus*] in California, was shown by inoculation experiments with pure cultures on maize meal to be pathogenic to the plants. Spontaneous infection was characterized by extensive decay of the cortical tissues of the stem base and larger roots; the yellow or brown lesions at or below soil level became sunken and were liable to be sloughed off, and the growing part of the stalk killed. Some 50 per cent. of the plants were destroyed or rendered valueless, the resultant financial loss amounting to several thousand dollars. Infection was traced to the water supply and compost soil, the sterilization of which completely prevented wilting. A yellow bacterium and *Cephalosporium acremonium*, isolated simultaneously with the *Phytophthora*, were non-pathogenic.

ALCOCK (Mrs. N. L.). **Downy mildew of Meconopsis.**—*New Flora and Silva*, v, 4, pp. 279–282, 1 pl., 1 fig., 1933.

A semi-popular account is given of the downy mildew of *Meconopsis betonicifolia*, *M. wallichii*, *M. integrifolia*, *M. regia*, and other species, caused by *Peronospora arborescens* [*R.A.M.*, viii, p. 576], the agent of a similar disease of poppies. Light brown or yellow, later black blotches occur on the upper side of the leaves, the corresponding areas on the lower surface being covered with a white or grey to faintly mauve down. The infection also involves the buds, calyces, seed-capsules, and seeds. The fungus overwinters in the soil or on plant débris, especially capsules, by means of the oospores, the presence of which in and on the seed strongly points to the latter as a source of transmission. Control measures should include thorough sanitation and the use of clean seed.

YOSHII (H.). **On the pathogenic organism of the leaf spot of Gomphrena globosa.**—*Ann. Phytopath. Soc. Japan*, ii, 6, pp. 513–519, 1 fig., 1933. [Japanese, with English summary.]

A fungus closely resembling *Macrosporium* [*Alternaria*] *solani*, *M. carotae*, or *M. porri* [*R.A.M.*, x, p. 436; xi, p. 224] was isolated from leaf spots on *Gomphrena globosa* at Fukuoka, Japan, and its pathogenicity proved by inoculation experiments. The organism is stated to correspond morphologically with *A. gomphrenae* Togashi, differing considerably from the latter, however, in cultural characters. The conidia produced on the host are long, tapering, and slender-beaked, arising singly at the tips of the conidiophores. Ordinary cultural methods failed to yield conidia, which developed,

however, from hyphal fragments kept for several days in a moist chamber.

JOHNSON (E. M.) & VALLEAU (W. D.). **Black-stem of Alfalfa, Red Clover and Sweet Clover.**—*Kentucky Agric. Exper. Stat. Res. Bull.* 339, pp. 57–82, 3 figs., 1933.

Details are given of the authors' investigations of the condition of lucerne, red clover (*Trifolium pratense*), and sweet clover [*Melilotus alba*] in Kentucky, which was recently described under the name black stem [*R.A.M.*, viii, p. 726; xi, p. 461]. The results showed that in each of these hosts the disease is caused by a different fungus. In lucerne the cause is a species of *Phoma* closely agreeing in its morphology with the description of *P. medicaginis* Malbr. & Roum., which is considered to be probably synonymous with *Phyllosticta medicaginis* [ibid., xi, p. 653]. Preference is given to the first name because the fungus lives throughout the year in the stems of the host, from which in the spring it spreads to the newly formed leaves and stems. In red clover the disease is caused by another species of *Phoma* which does not appear to have been described hitherto, and for which the name *P. trifolii* n. sp. is suggested; an English technical description is appended. It differs from *P. medicaginis* in spore shape, cultural characters, and in the rate at which it discolours the affected tissues. *Pleospora* perithecia were found in association with this fungus on dead red clover stems, but no evidence of a genetic connexion between the two has yet been obtained. The sweet clover pathogen was shown in pure culture to be probably identical with *Mycosphaerella lethalis* [ibid., iii, p. 610].

In all three hosts the greatest injury by the black stem pathogens is caused soon after growth is resumed in the spring, owing to extensive killing of the leaves and the tender young shoots. Blackening of the stems occurs chiefly late in the spring and, while it is the most conspicuous symptom, causes comparatively little damage to the crops. In lucerne and red clover black stem continues to develop during the summer if the crops are not cut down. The investigation also indicated that the disease plays an important part, previously unrecognized, in the failure of all three crops. Stands of red clover varieties unadapted to Kentucky conditions may be destroyed completely when about a year old, the injury being apparently cumulative from the preceding year, but varieties that have been grown there for many years appear to be little injured. Lucerne varieties seem to exhibit distinct differences of resistance, but under conditions favourable to the disease stands are greatly reduced and occasionally entirely destroyed. Individual sweet clover plants show marked differences in their susceptibility to injury from *M. lethalis*. It is believed that losses in red clover may be greatly minimized by the use of adapted varieties, and in lucerne by the destruction of the infected aerial parts through grazing or otherwise during summer.

TRIWOSCH (S.). **Das Eisen als Mittel zur Bekämpfung der Chlorose der gelben Lupine (Lupinus luteus) auf kalkhaltigen bzw. gekalkten Böden.** [Iron as a means of combating chlorosis

of the yellow Lupin (*Lupinus luteus*) on calcareous or limed soils.]—*Zeitschr. für Pflanzenernährung, Düngung und Bodenkunde*, A, xxxi, 1–3, pp. 14–27, 1933.

The writer's investigations [which are fully described and tabulated] in Silesia indicate that the severity of chlorosis of the yellow lupin (*Lupinus luteus*) [*R.A.M.*, xi, p. 721] increases parallel with a rising lime content of the soil, but the primary source of the trouble appears to lie rather in a disparity between the amounts of lime and iron in the soil than in the alkalinity of the latter.

HARRISON (T. H.). **Brown rot of fruits and associated diseases of deciduous fruit trees. I. Historical review and critical remarks concerning taxonomy and nomenclature of the causal organisms.**—*Journ. & Proc. Roy. Soc. New South Wales*, lxvii, pp. 132–177, 1933.

In this paper the author critically discusses the validity, in the light of the International Rules for botanical nomenclature, of the various taxonomic combinations used in the relevant literature [54 titles of which are cited in the bibliography appended] for the organisms causing brown rots of fruits and related diseases of the trees. In agreement with Roberts and Dunegan [*R.A.M.*, xii, p. 228], he considers that the correct binomial for the American brown rot fungus is *Sclerotinia fructicola* based on Winter's description of its apothecial stage in 1883 under the name *Ciboria fructicola* which was transferred in 1906 by Saccardo to the genus *Sclerotinia* on the authority of Rehm, and therefore easily antedates all the other combinations suggested. Schröter's combinations *S. cinerea* and *S. fructigena* are considered to be *nomina nuda*, since it is apparent from his descriptions that they referred only to the *Monilia* stage of the organisms; for this reason the combination *S. fructigena* Aderh. & Ruhl. must replace *S. fructigena* (Bon.) Schr. As a result of detailed studies made in England and on the continent of Europe in 1930–32, he further concludes that the fungus causing brown rot of apricots in Europe is co-specific with *S. cinerea*. Since, however, this name was first validly used in 1921 for the perfect stage which had already been properly described in 1905 by Aderhold and Ruhland under the name *S. laxa*, the latter combination must have priority and is therefore the correct one for the fungus. Evidence is adduced to show that the dominant form of this organism, which not only has an extensive host range among stone fruits but is found widely distributed in the northern hemisphere, is the biologic form *pruni* [ibid., vi, p. 619; viii, p. 179] which, furthermore, is the only one that has been connected with the perfect stage. In consequence, this form is considered as the type of the species, and the form names *pruni*, *cerasi*, and *avium* become superfluous and should be discontinued, the more so since the fungus has been shown also to affect pears and quinces. For the present, however, it is thought desirable to maintain the form name *mali* for the fungus Wormald proved to be the cause of blossom wilt of apples in England, and which should therefore be known as *S. laxa* f. *mali* [cf. ibid., ii, p. 547].

Finally, the author considers it preferable for the time being to retain all the species dealt with in the genus *Sclerotinia*, but in

the event of this genus being split up, the evidence available indicates that the fruit rotting species should be listed under the genus *Stromatinia* rather than under *Monilinia* [ibid., vii, p. 744].

BURRELL (A. B.) & PARKER (R. G.). **Field trials with lime-sulphur and Koppers flotation sulphur in Apple scab control.**—*Proc. Amer. Soc. Hort. Sci. 1932*, xxix, pp. 98–102, 1933.

Details are given of a single year's field tests on five commercial orchards of 14- to 26-year-old McIntosh apples in the Champlain Valley of New York to determine the relative efficacy against scab [*Venturia inaequalis*] of lime-sulphur solution (2½ galls. at 32° Baumé diluted to 100 galls.) and Koppers flotation sulphur [*R.A.M.*, xii, p. 572], used at the rate of 10 lb. per 100 galls. for the paste and 5 lb. for the dry wettable form. Lead arsenate was included in all applications at the rate of 2½ to 3 lb. per 100 galls. Six to nine applications were given with power sprayers delivering a pressure of 250 to 350 lb., except in one orchard where a Rex Liquiduster (in which a small stream of liquid under low pressure is introduced into the air current from a blower, and thereby broken up into a mist) was used. Good commercial control of scab (the incidence of which on the untreated trees ranged from 7 to 74 per cent.) was obtained in all the experimental orchards, the average amounts of infection on the flotation sulphur plots being 1·3 and 1 per cent. (paste and dry, respectively), and on those sprayed with lime-sulphur 0·2 to 0·3 per cent. The severe scorching of the foliage conspicuous in two of the lime-sulphur series was entirely absent from those treated with flotation sulphur, and was traceable to the pink and petal fall sprays having been given during damp weather.

MACDANIELS (L. H.) & BURRELL (A. B.). **The effect of sulfur fungicides applied during bloom on the set of Apple fruits.** —*Proc. Amer. Soc. Hort. Sci. 1932*, xxix, p. 61, 1933.

The results of experiments in three localities of New York State indicated that an approximately equal reduction in the set of apple blossoms followed the application of either lime-sulphur 1 in 40 or sulphur dust, the heaviest decline being caused by treatment 24 hours before pollination, and the next by applications simultaneous with pollination. Under favourable pollination conditions the fruit can apparently be treated late in the flowering period without detrimental effects.

HOFFMAN (M. B.). **The effect of certain spray materials on the carbon dioxide assimilation by McIntosh Apple leaves.**—*Proc. Amer. Soc. Hort. Sci. 1932*, xxix, pp. 389–393, 1933.

Details are given of an experiment in which it was shown that the application of lime-sulphur (2½ in 100 galls.) caused a considerable reduction in carbon dioxide utilization by McIntosh apple leaves even when there was no sign of leaf injury, the effect persisting for a fortnight after treatment. This phenomenon was specially noticeable in the lighter green foliage, the photosynthetic activity of which declined markedly (down to only 3 per cent. of that of the unsprayed in one test) on the first day after spraying

and only partially recovered (65 per cent. reduction) on the second day. Lime-sulphur being generally used in the early part of the season, when a heavy organic food supply is demanded by the rapidly developing trees, any loss of leaf efficiency at this time may seriously affect fruit setting and other activities. The slight reduction of carbon dioxide assimilation sometimes following treatment with Bordeaux mixture in the author's tests was purely temporary and is attributed to a physical effect of the precipitate rather than to a chemical disturbance.

McClintock (J. A.). **The source of Apple seedlings in relation to blotch infection.**—*Proc. Amer. Soc. Hort. Sci. 1932*, xxix, pp. 359–360, 1933.

Every year since 1923, when attention was first called by M. W. Gardner and H. S. Jackson to the frequent occurrence of blotch [*Phyllosticta solitaria*] on apple seedlings [*R.A.M.*, iii, p. 277], the writer has observed cankers on mid-western nursery trees, the percentage of infection reaching a maximum of 47 in 1931. Under Federal quarantine regulations European apple seedlings may not be imported into the United States, so that the blotch-free French crab seedlings are no longer available for grafting or budding. In any case the resistance of the French material to *P. solitaria* was not maintained in the Middle West, and the solution of the problem thus appears to lie in the procurement of nursery material from the Pacific coast States in which, according to official records cited by N. E. Stevens in correspondence, the disease does not occur spontaneously. The writer has for several years verified the absence of blotch on western seedlings by a close examination of commercial shipments.

Braun (K.). **Obstfäulnis bei Aepfeln und ihre Verhütung.** [Decay of Apple fruits and its prevention.]—Reprinted from *Landw. Wochenbl. und Genossenschaftl. Mitteil. Schleswig-Holstein*, lxxxiii, 31, 33, 35, 37, 6 pp., [1933].

Full directions are given in popular terms for the prevention of some important fungous diseases of stored apples by suitable site and type of store, temperature, humidity, light, ventilation, and other practical measures. The diseases usually encountered are bitter rot (*Gloeosporium fructigenum*) [*Glomerella cingulata*], brown rot (*Cylindrocarpon mali*) [*Nectria galligena*], grey rot or mould (*Botrytis cinerea*), green rot or mould (*Penicillium glaucum*), kernel rot (*Fusarium herbarum*: syn. *F. putrefaciens*) [*R.A.M.*, ix, p. 253; xi, p. 53], *Mucor* sp., black rot or cushion mould (*Sclerotinia fructigena*), *Phoma* rot, pink mould (*Trichothecium roseum*), and *Sphaeropsis* rot [*Physalospora cydoniae*].

Kidd (F.) & West (C.). **Gas storage of fruit. III. Lane's Prince Albert Apples.**—*Journ. Pomol. and Hort. Science*, xi, 2, pp. 149–170, 1 diag., 2 graphs, 1933.

This is a detailed account of the results obtained in experiments in 1931–2, in which the effect was studied of storage in regulated atmospheres at different low temperatures on Lane's Prince Albert apples, and which were conducted on the same lines (save for

certain modifications in the composition of the atmospheres) as those described for Bramley's Seedlings in a previous communication [*R.A.M.*, ix, p. 533]. Notes were taken on the physical and chemical changes that occurred in the fruit, and also on the various functional breakdowns (superficial scald, brown heart, internal breakdown, and core flush) and fungal decays that developed during storage under the different conditions. The best conditions for this variety of apples appeared to be an atmosphere containing 2·5 per cent. oxygen and 5 per cent. carbon dioxide at a temperature of 4° C. (39° F.), since the commercial storage life of the fruit thus treated was twice as long as that of apples kept in air at the same temperature, and nearly twice as long as that in air at 34° F. (ordinary cold storage).

Olliver (Mamie) & Smith (G.). **Byssochlamys fulva, sp. nov.**—*Journ. of Botany*, lxxi, 847, pp. 196–197, 1 pl., 1933.

In this description (in which a Latin diagnosis is included) of *Byssochlamys fulva* sp. nov. the authors state that the fungus, which was frequently isolated from processed fruits, appears to be fairly widespread in England, and is of considerable economic importance as a cause of spoilage in tinned and bottled fruits. In this second species of the genus *Byssochlamys* established by Westling in 1909, the conidial fructification is of the *Paecilomyces* type and the fungus is readily disseminated by the abundant, elliptical conidia, 4 to 9 by 2·3 to 2·5 μ in diameter, borne in long chains. The globose asci, which measure 11 to 12 μ in diameter, are produced in clusters without any peridium or enveloping hyphae, so that the fungus is a transitional form between the Endomycetaceae and the Gymnoascaceae. The smooth, hyaline, ovate ascospores, 8 to the ascus, measure 6 to 6·5 by 4·3 to 4·5 μ.

The natural habitat has not yet been found, all the isolations having been made from tinned and bottled fruits. The mature spores survive cooking for thirty minutes at 87° to 88° C.

Marsh (R. W.). **Observations on Pear scab.**—*Journ. Pomol. and Hort. Science*, xi, 2, pp. 101–112, 3 figs., 1 diag., 1933.

The study of the mechanism of infection of pear shoots (of the very susceptible Fertility variety) by *Venturia pirina* [*R.A.M.*, xii, p. 639] showed that the first stages of the process are very similar to those in apple shoot infections by *V. inaequalis* [ibid., xi, p. 725], with the difference that the pear scab fungus appears to be more frequently able to penetrate cork in process of formation than the latter, and is thus able to start infections at a considerable distance from the tip of the growing shoot. Once the under side of the bark is reached, the fungus spreads not only in the phellogen but also in the collenchymatous layers of the cortex, where the hyphal tips penetrate the thick cell-walls and continue to grow in the middle lamellae. Adjoining cells are wedged apart by the stouter portions of the hyphae, and are finally completely surrounded by them. The penetration of the cortex occurs much more rapidly in the tangential than in the radial direction, and results, during the summer months, in the formation of a shallow

stroma, which may attain 2 to 3 mm. in length, and which includes the remains of the disintegrated collenchyma. The development of such primary stromata is restricted by the formation of cork barriers before the end of the summer period of shoot growth, but occasionally the barriers may be passed radially by the fungus before complete suberization or, more commonly, they may fail to unite with the normal cork at the perimeter of the lesion in time to prevent fresh extensions of the fungus. During the winter, and owing to the fact that no new cork formation occurs in the host, the hyphae of the subsidiary stromata thus formed interpenetrate the cortical cells below, while above they form distinct pseudo-parenchymatous columns, visible to the naked eye as a ring of protuberances forcing up the bark. By January spore formation is common on the sides of these columns, and at any time in the first three months of the year large flakes (at times 1 cm. long) of the bark are forced off by the pressure exerted by the fungus, thus exposing the fungus stroma with its numerous papillate spore-bearing structures united on a common base.

As indicated by spore-catching experiments [the results of which are shown in tables] at Evesham and Long Ashton, dissemination of the new spores may start in January, but does not reach its maximum until March or April. Towards the end of April the activity of the pustules is checked and eventually stopped following the renewal of growth by the shoots, when new phellogen develops and extensive cork barriers are formed beneath the infected areas, with the result that by June the abscission of the latter is complete and the lesions are shed, leaving a concave, cork-lined scar on the shoot.

The remainder of the paper is given to a brief discussion of the results obtained in 1931 and 1932 in spraying experiments in a commercial Fertility pear plantation near Evesham. It was found that under conditions favourable to the disease (1932) two sprayings were useless, while with six applications the proportion of clean fruit was raised from 2 per cent. in the controls to 60 per cent. in the treated plots. The Doyenné du Comice variety appears to be particularly susceptible to damage from lime-sulphur and Bordeaux mixture.

TAI (F. L.). **Pear rust caused by Gymnosporangium haraeanum Syd. and its control.**—*Nanking Journ.*, iii, pp. 143–152, 9 figs., 1933. [Chinese, with English summary.]

The rust *Gymnosporangium haraeanum* is stated to damage foreign and native pears (*Pyrus communis*, *P. calleryana*, *P. betulaefolia*, *P. serotina*, *P. sinensis*), quinces, *Chaenomeles* [*Cydonia*] *lagenaria*, *Crataegus cuneata*, and *Juniperus chinensis* in China. Most foreign pear varieties are immune from the disease, but Garber, Kieffer [*R.A.M.*, v, p. 107], Laurence, Le Conte, and Flemish Beauty are susceptible, though less so than the Chinese species, which are very severely attacked. Inoculation experiments on quinces and *P. serotina* with teleutospores of the rust from the leaves and twigs of *J. chinensis* gave positive results in 1925 and 1928. A comparison is made between *G. haraeanum* and *G.*

japonicum, both attacking *J. chinensis*. A reduction of 43 per cent. in the number of diseased pear leaves was effected by spraying in 1931.

HUTCHINS (L. M.). **Identification and control of the phony disease of the Peach.**—*Office of the State Entomologist, Georgia, Bull.* 78, 55 pp., 3 col. pl., 15 figs., 2 maps, 1933.

In little more than ten years phony disease [*R.A.M.*, xii, p, 703] has attacked over one million peach trees in Georgia, where forty years ago it was no more than a curiosity. First recognized as commercially important in 1915, it rapidly became enormously destructive in the heavily planted central regions of Georgia, and spread to Florida, Alabama, Mississippi, Tennessee, and the Carolinas, as well as to parts of Louisiana, Texas, Arkansas, Oklahoma, Missouri, and Illinois, the accompanying maps showing its distribution in 1928 and 1933. In one property covering 1,000 acres in Georgia and originally yielding 250 carloads of fruit annually, the disease, which had affected an occasional tree in 1900, from 1915 onwards became so devastating that in 1928 no fruit could be sent out, and all the blocks of bearing trees had to be cut down, some 600 acres of what had once been among the finest peach orchards in Georgia being planted to grain. In the same locality a block of 2,100 Hiley trees planted in January, 1919 showed 90 and over 1,200 affected trees in 1921 and 1927 respectively, while by 1931 over 99 per cent. had become diseased. In another planting, separated from the others by several miles of farm lands and woods and where in 1921 out of 50,000 trees fewer than 0·1 per cent. were affected, in 1931–2 3,980 trees had to be cut down, most of the increase having occurred in the previous four or five years.

From 1929 to 1932, inclusive, 40,538,560 peach trees, practically all in commercial orchards, were inspected during the phony peach eradication campaign, and of this number 449,754 were found to be affected, 437,038 in Georgia alone.

In addition to the external symptoms already noted, which are recapitulated at length [ibid., viii, p. 388 ; ix, p. 727], brown streaks are often seen running lengthwise through much of the woody cylinder of trees long or severely affected.

A simple identification test for phony disease applicable at any time of the year consists in taking clean, white, unblemished root pieces 4 to 6 in. long, the woody cylinder being 0·5 to 0·75 in. in diameter, from each of four sides of the tree and remote from any malformation or injury, washing, removing the excess water, and immersing transverse sections 0·5 to 1 mm. thick in a reagent prepared by adding 1 to 5 (generally 2 or 3) drops of concentrated, chemically pure solution of hydrochloric acid to each 25 cc. of absolute methyl alcohol. A positive result is indicated when 10 to 50 or more definite, intensely coloured, purplish spots up to 2 mm. in diameter and distributed over the entire surface of the section show up against a clear background of whitish or faintly purple or lavender wood. In a well-developed case of the disease every suitable root generally gives a good positive result. Very often a conclusive positive test is obtained before the tree has emerged from the incubation period of the disease.

In old infections faintly discernible to definitely brown spots (due to the brown streaks referred to above) may appear in the wood; if these are tested as described, they turn purple, and a large number of new spots, previously invisible to the naked eye, will appear.

As a rule, two full seasons' growth are required before the symptoms of phony peach become definitely recognizable.

Exhaustive tests are described which showed that the disease may be readily transmitted experimentally by root-grafting, even minute portions of the roots of diseased trees sufficing to infect healthy ones.

Circumstantial evidence points to the peach borer (*Aegeria exitiosa*) as the insect vector of the virus.

The only practicable method of control is to destroy the diseased trees immediately the symptoms are identified.

CRISTINZIO (M.). **Osservazioni su una malattia del Pesco.** [Observations on a disease of the Peach.]—*Ricerche e Divulg. Fitopat. per la Campania ed il Mezzogiorno*, ii, pp. 28–44, 4 figs., 1933. [Abs. in *Riv. Pat. Veg.*, xxiii, 7–8, p. 325, 1933].

An outbreak of a die-back of peach branches in some orchards in the neighbourhood of Naples caused by *Cytospora leucostoma* [cf. *R.A.M.*, xi, p. 745] leads the author to recommend the removal from affected orchards of all the dead trees, together with a severe pruning of all the infected ones. The trees, after pruning, should be thoroughly swabbed with a 15 to 20 per cent. solution of iron sulphate while still in the dormant stage. An extensive bibliography on the genus *Cytospora* and related fungi is appended.

CHANDLER (W. H.), HOAGLAND (D. R.), & HIBBARD (P. L.). **Little-leaf or rosette of fruit trees, II: effect of zinc and other treatments.**—*Proc. Amer. Soc. Hort. Sci. 1932*, xxix, pp. 255–263, 1 fig., 1933.

During the winter and spring of 1931–2 many trees affected by little leaf in California were treated with zinc compounds and some with other substances [*R.A.M.*, xii, p. 99]. Peach trees in sandy soil receiving quantities of zinc sulphate ranging from 1 lb. over a radius of 8 in. round the trunk to 100 lb. over 10 ft. showed varying degrees of improvement after shorter or longer periods. Used at the rate of 5 or 10 lb. over a 7 ft. radius, zinc sulphate produced effects comparable to those obtained with 20 to 40 lb. of impure ferrous sulphate. The action of zinc chloride (5 to 20 lb.) approximated to that of zinc sulphate at the same rate. Apple trees in sandy loam responded to applications of 15 to 30 lb. zinc sulphate over a radius of 6 ft., while a striking improvement was manifested by Payne walnuts receiving 10 to 15 lb. over a 3 ft. radius. Santa Rosa plum trees in sandy loam reacted very favourably to the application of either 5½ lb. zinc sulphate alone or 5 lb. zinc sulphate + 5 lb. ferrous sulphate in basins with a radius of 2½ ft., while almost equally good results were given by surface applications of the former at the rate of 9 lb. over a 7 ft. radius or 6 lb. over 3 ft. Old orange trees in very heavy loam with coarse sand were markedly benefited by 20 to 40 lb. zinc sulphate over

an 8 ft. radius, smaller amounts giving less satisfactory results. Younger trees showed complete recovery after treatment with 5 lb. over a radius of 1 ft. or 10 to 20 lb. over 4 ft. Applied at the rate of 20 to 50 lb. over a radius of 3 ft. zinc sulphate also corrected a condition resembling and probably identical with little leaf in corral soils. In a few tests on peach, apple, and orange trees beneficial effects were also obtained by injecting zinc sulphate into holes in the trunk [cf. ibid., x, p. 677]. A spray consisting of 6 lb. each of zinc sulphate and hydrated lime in 50 galls. was applied to affected vines and other trees on 17th June, 1932, with excellent results in the case of the first-named.

Some observations made in the course of these experiments throw doubt on the obvious inference from the results, i.e., that little leaf is a sequel to a deficiency of zinc for normal metabolism. It is scarcely probable, indeed, that zinc would be lacking over such extensive and diverse areas as those comprised between the Canadian boundary in Washington and Mexico in the south and Georgia in the east, and a climatic influence seems more likely to operate in the distribution of little leaf. Chromogenic bacteria, liberating very toxic substances, have been isolated from the soil in affected areas, and it is thought possible that such poisonous elements may be precipitated by compounds of zinc, mercury, silver, and calcium in higher concentrations.

WALLACE (T.) & PROEBSTING (E. L.). **The potassium status of soils and fruit plants in some cases of potassium deficiency.** —*Journ. Pomol. and Hort. Science*, xi, 2, pp. 120–148, 1933.

A detailed account is given of the authors' chemical analysis of surface soil samples from 23 different centres in England, where fruit trees and bushes exhibited marked potassium deficiency associated with leaf scorch [cf. *R.A.M.*, x, p. 802]. The results showed that such soils contained low amounts (as judged by standards set for agricultural plants) of potassium present as water extractable, citric acid soluble (Dyer's method), and replaceable (exchangeable) forms. The analysis of samples of similar soils, but which had received heavy dressings of potassic or farmyard manures for considerable periods, revealed the presence in them of large percentages of the added potassium in the exchangeable form, while single year dressings with these manures, which were effective in overcoming the deficiency effects, also caused significant increases in the amounts of potassium present in the soil in all three forms. These manurial treatments significantly raised the potassium contents of the plants [loc. cit.].

GUBA (E. F.). **'Suspected mosaic' of the Strawberry.**—*Phytopath.*, xxiii, 8, pp. 654–661, 4 figs., 1933.

In Massachusetts the strawberry disease known as 'gold leaf' [*R.A.M.*, xii, p. 494] is restricted to the Howard 17 variety, in which it induces degeneration of the plants. In districts outside New England the same disorder (which has been designated 'suspected mosaic' by Berkeley in Canada [ibid., xi, p. 252] and 'non-infectious chlorosis' by J. H. Clark in New York [ibid., xii, p. 204]) has been reported on the Van Dyke, Eaton, and other new

varieties. It is evidently identical with the chlorosis [yellows or xanthosis] studied by Plakidas [ibid., xii, p. 520; see also xi, p. 250].

An important feature of the chlorotic condition is its development in late April after the new beds are planted, followed by disappearance in the first week in July. The leaves, flowers, and fruit show all stages of dwarfing but no mosaic symptoms have been detected on the fruit.

The writer has found that seed from affected plants produces both chlorotic and healthy seedlings, the former showing a marked tendency to stunting and their ultimate death being associated with an almost complete absence of chlorophyll. The latter feature is typical of genetic chloroses as opposed to the degeneration of chlorophyll accompanying virus diseases. Negative results were given by experiments in the transmission of gold leaf by various insects, as well as by inoculation with the sap of diseased plants. The condition of the chlorotic plants was not improved by the application of different fertilizers.

In the spring of 1932 gold leaf suddenly developed in a bed of Howard 17 strawberries raised from seed, the stock having been entirely free from the disturbance as long as vegetative propagation had been followed. Accepting the hypothesis of a genetic origin of the disorder, the use of volunteer seedlings for propagation would account for its extension. Gold leaf is systemic, and since its manifestations are not apparent until the early spring, the use of daughter plants from chlorotic mother strawberries for the new beds cannot well be avoided. Experiments have shown that roguing and selection are ineffectual against gold leaf, the symptoms of which may be masked or modified by dry spring conditions. The recessive genetic factor responsible for gold leaf is considered to be dependent on certain environmental conditions for its expression.

Bergman (H. F.) & Truran (W. E.). **An apparent case of transmission of Cranberry false blossom through a natural graft.** —*Phytopath.*, xxiii, 8, pp. 670–672, 1 fig., 1933.

Hitherto the transmission of false blossom of cranberry [*R.A.M.*, xii, p. 706] was practicable only with the aid of the leafhopper, *Ophiola striatula* [*Euscelis striatulus*], but in 1932 the symptoms of the disease were observed on a natural graft between an apparently healthy and a diseased cutting of the Wales Henry variety in Massachusetts. Infection seemed to proceed upwards from the line of union in the graft.

Davey (A. E.) & Smith (R. E.). **The epidemiology of Fig spoilage.** —*Hilgardia*, vii, 13, pp. 523–551, 4 figs., 1933.

Continuing their studies at Merced, California, on the epidemiology of the spoilage diseases of uncaprified, second-crop Adriatic figs [*R.A.M.*, xi, p. 522], the writers found that, up to about 1st July 1932, nearly all the green, almost full-grown figs with closed eyes were internally sterile, but the fruit approaching maturity subsequent to that date was found to contain an increasing percentage of bacteria, yeasts, and moulds (*Alternaria, Cladosporium, Hormodendrum, Macrosporium*, and *Penicillium* spp.).

The fig-smut fungus (*Aspergillus niger*) was detected in a small proportion of the fruit previous to the opening of the eyes, and early in August there was a sudden marked increase in the development of this organism and *Rhizopus* sp., closely followed by souring due to various yeasts. In the early stages, before the eye of the fig opens, mites may be responsible for introducing these organisms, and later on they may be carried by the dried-fruit beetle (*Carpophilus hemipterus*), but conclusive evidence on the relation between particular insects and moulds is still lacking.

SIMMONDS (J. H.). **Squirter disease of Bananas.**—*Queensland Agric. Journ.*, xl, 2, pp. 98–115, 3 pl., 1 graph, 1933.

After briefly reviewing the symptoms, geographical distribution, economic importance, and history of squirter disease of bananas [*R.A.M.*, xii, p. 40] the author states that affected material in Queensland consistently yielded an organism identified at the Imperial Mycological Institute as *Nigrospora sphaerica*, inoculations with which into healthy bananas gave typical squirter, the fungus being reisolated. Natural infections generally take place through the broken fruit-stalk, but sometimes through the apex or through lateral wounds.

The organism was frequently present on banana refuse near the packing-sheds and on dead trash on the ground or hanging round the pseudostem in the plantations. It was found fairly consistently on white leaf lesions due apparently to sun scald. In one plantation where loss had been sustained spores were noted on the surface of the skin of fruits in the packing-shed.

Nigrospora spores were also found on the dead parts of *Digitaria didactyla* [*Panicum didactylum*], *Pennisetum clandestinum*, *Chloris gayana*, sorghum, *Sorghum halepense* [*Andropogon halepensis*], *Paspalum dilatatum*, *Rynchelytrum roseum*, and *Imperata cylindrica* var. *koenigii*. According to spore measurements the fungus on the first five of these belonged to the *N. sphaerica* group, while on the last three the spores were smaller, resembling two squirter strains in this respect. Bananas inoculated with cultures and spores from some of these hosts developed typical rot, from which the *Nigrospora* was reisolated.

For the present all the forms of *Nigrospora* associated with monocotyledons in Queensland should, in the author's opinion, be regarded as belonging to the group included in the species represented by *N. sphaerica* (Sacc.) Mason, though a distinct strain marked by certain cultural features and its greater pathogenicity towards banana fruits is probably responsible for most of the squirter trouble. In most cases the fruit is probably contaminated before the bunch is cut.

Over 80 strains of *Nigrospora* isolated from seven hosts fell, as regards cultural characters, into two main groups of which one, characterized by straggly hyphae, included all the isolations from typical squirter as well as others from the leaf, bunch spathe, petiole, and fruit surface of bananas, and from sorghum, *A. halepensis*, and *P. clandestinum*. Strains from the second group were obtained from banana leaf, petiole, and fruit surface, *P. didactylum*, *P. dilatatum*, and *R. roseum*. A few other distinct forms were

observed. Though definite lesions resulted from inoculations with the second group, the evidence suggested that the strains of the straggly type are the most actively pathogenic and are those which cause squirter. This type appeared most frequently in material collected shortly after an exceptionally cold spell.

Between 1928 and 1933 the first outbreak of the year and some of the worst later ones often followed a sudden drop in the minimum field temperature to between 40° and 45° F. When the disease occurred the average temperature in Melbourne was usually well below 60°. Infection is not generally severe until about midwinter (the end of June), but it may continue into the spring.

The optimum temperature for strains of *N. sphaerica* from original squirter infections ranged from 72° to 77°; there was little growth below 50° and none at about 91°. The maximum amount of fruit rotting took place at a temperature a few degrees below the optimum for the growth of the fungus. Typical squirter is produced only in the intermediate stages of ripening. If present, a temperature factor must therefore act in regard to the fruit itself. That the method of ripening definitely affects squirter development was shown by the fact that inoculated fruits ripened under standard conditions (66° to 69°) had an average length of only 2·6 cm. of rotted tissue, as compared with 6·4 cm. in fruits ripened without gas at 61° to 70°.

Notes are given on control by improved sanitation and packing methods (packing in 'hands' not 'singles'), and the protection of the fruit against cold.

[This paper is reprinted as *Queensland Dept. of Agric. & Stock, Divn. of Ent. & Plant Path. Pamphl.* 11, 17 pp., 3 pl., 1 graph, 1933.]

McLennan (Ethel I.) & Hoëtte (Shirley). **Nigrospora musae n. sp. and its connexion with 'squirter' disease in Bananas.** —*Australian Inst. Sci. and Indus. Res. Bull.*, 75, 36 pp., 1 pl., 9 figs., 5 graphs, 1933.

In the flesh of bananas affected with squirter disease [see preceding abstract] the authors constantly found the inter- and intracellular hyphae, 3 to 10 μ in diameter, of a *Nigrospora*. In plate culture on malt agar the fungus formed a water-soaked, stalled colony with very characteristic cottony white strands growing towards the lid of the plate and gradually covering the whole surface until it resembled cotton wool. The upper surface was white, the lower one becoming olive-citrine to nearly black. The light brown, later black, subspherical spores borne on short inflated conidiophores or at the ends of side branches from the main hyphae averaged 18 by 15 μ. The minimum, optimum, and maximum growth temperatures were 5°, 19°, and 32·5° C., respectively.

The organism corresponded in spore size with cultures of *N. sphaerica* (16 to 18 μ) and *N. panici* (17 to 19 μ) [*R.A.M.*, vi, p. 758] obtained from Baarn, but differed from them so considerably in cultural characters and growth rate that it is regarded as a distinct species and is named *N. musae* n. sp., this being the first Australian record of the genus. It was also isolated from banana leaves.

Another *Nigrospora*, obtained from the leaves only, had jet-black, subspherical spores measuring 10 by 17 μ. On malt agar a ten-day-old culture showed a cottony upper surface due to vertical strands of hyphae which, however, did not grow to the edge of the dish. The colony was distinctly zoned and as a whole was a dirty cream, though the lower surface was pale orange to orange-buff. No growth took place at 6·5°, the optimum growth temperature was 28°, and the maximum over 32°. As the fungus did not agree with any previously described *Nigrospora* and was quite distinct from *N. musae*, it is named *N. canescens* n. sp. It was not pathogenic to injured green bananas.

A few hyphae were found in the stalks of all the squirter bananas examined; the path of infection into and through the fruit was traced, and it was ascertained that the characteristic unaffected area at the stalk end results from the limitation (during the early stages) of the fungus to the vascular tissue until it reaches the ovular region.

Inoculation experiments demonstrated that *N. musae* is pathogenic to injured green banana fruits though having little effect on ripe ones, and that when the inoculum was placed on or into the cut ends of the stalks of green bananas, under suitable conditions of temperature and humidity, squirter symptoms were reproduced in the laboratory. *N. sphaerica* was also pathogenic, producing a soft brown rot resembling that caused by *N. musae* but less extensive. *N. oryzae* and *N. panici* were not pathogenic.

The localization of squirter to fruit ripened in Sydney and Melbourne was found to be correlated with the method of packing in 'singles', i.e., individual fruit, instead of in bunches.

Passionfruit in N.S.W. Crops reduced by fungoid disease.—*Fruit World of Australasia*, xxxiv, 7, p. 382, 1933.

Twenty years ago the average yield of each passion-fruit vine [*Passiflora edulis*] in New South Wales was half a bushel of fruit, whereas to-day it has fallen to one-quarter of a bushel, with the result that although there are at present 250,000 vines in bearing in the State, or twice as many as there were twenty years ago, the total production remains about the same, i.e. 50,000 bushels. The main cause of this situation is the failure of the growers to adopt proper control methods against the two diseases, brown spot [*Macrosporium* sp.: *R.A.M.*, x, p. 394; xii, p. 576], which has worked havoc on coastal plantations, and woodiness [ibid., viii, p. 185].

Marsais (P.). **La préparation des bouillies bordelaises exposée à la Ligue de lutte contre les ennemis des cultures.** [The preparation of Bordeaux mixtures discussed at the League for combating the enemies of cultivated plants.]—*Rev. de Vitic.*, lxxix, 2039, pp. 69–79, 1933.

This is a fairly full review of the papers that were read by French and Swiss workers at the meeting on 18th May, 1933, of the French League for combating the enemies of cultivated plants [*R.A.M.*, vi, p. 429], on the preparation of Bordeaux mixture for

the control of various crop diseases. In the discussion that ensued, widely diverging views were manifest regarding the value of the different methods of preparation now in vogue, and, in summarizing all the points raised, P. Viala, the Chairman, considered that the progress so far reached in the investigation of the problems involved was insufficient to allow of authoritative recommendations being made to practical growers. In his view the final criterion of the relative value of any of the methods considered is the efficacy of the mixture so prepared when tested in the field.

DESRUE (A.). **Les mouillants en agriculture.** [Spreaders in agriculture.]—*Rev. de Vitic.*, lxxviii, 2035, pp. 405–411, 1933.

The bulk of this paper is given to a general discussion of the practical desiderata which should be fulfilled by a spreading agent to increase the wetting capacity of spray liquids. This capacity, in practice, is a function of many factors, e.g., the pressure in the spraying apparatus, the velocity of the spray on reaching the leaves, the angle of incidence of the latter, and the like, and does not depend mainly, as many previous investigators seem to suggest, on the surface tension alone of the spray fluid [cf. *R.A.M.*, xii, p. 138]. He advises that no spreader should be recommended for extensive practical usage before carefully testing its efficacy in the field under varied conditions of application (pressure, etc.). Details are also given of the author's experiments [chiefly with insecticidal sprays] in 1932 and 1933, the results of which showed the great efficacy as spreaders of sulphonated terpene alcohols (recently put on the market under the name 'emol'), the main advantages of which consist in their compatibility with most of the usual fungicidal and insecticidal mixtures and solutions (except potassium permanganate), entire neutrality or very slight tendency towards alkalinity, ensuring their complete harmlessness to the host leaves, and their rapid elimination from the leaves after spraying. The dose recommended by the author is 250 gm. of emol to 1 hectol. of the spray mixture, and it is stated that all the leaf surfaces so far tested were found to be thoroughly wetted by sprays containing this preparation.

CHEVALIER (G.). **Le pouvoir mouillant des bouillies cupriques et des émulsions antiparasitaires. Son évaluation.** [Evaluation of the wetting capacity of cupric mixtures and parasiticidal emulsions.]—*Rev. de Vitic.*, lxxix, 2037, pp. 26–31, 1933.

The author tested the relative value of a number of substances (including seven proprietary preparations of unknown composition and origin) used as spreaders to increase the wetting capacity of cupric sprays and insecticidal emulsions, as measured by the proportional reduction brought about by these substances in the surface tension of the spray liquids, the latter being determined by the stalagmometer method [*R.A.M.*, xii, p. 139, and preceding abstract]. The results [which are presented in the form of tables] of tests with 2 per cent. Bordeaux mixture showed that the heaviest and most adhesive deposit of metallic copper on glass slides and vine leaves after two washings with artificial rain was

obtained with the proprietary preparations C and E, which reduced the surface tension of the normal spray from 0·990 (that of water being arbitrarily fixed as 1) to 0·543 and 0·583, respectively. At values above this range, the deposit accumulated in too small quantities and was less soluble, while at lower values, the spray was too fluid and deposited little copper, the latter being easily washed off by the artificial rain. Similar results were obtained after the addition of lead arsenate to the Bordeaux mixture.

NATTRASS (R. M.). **The control of fungus diseases.**—*Dept. of Agric., Cyprus, Bull.* 1 (Mycol. Ser.), 12 pp., 4 figs., 1933.

Directions are given in popular terms for the control of some important plant diseases in Cyprus by spraying and dusting with standard fungicides and by the indirect methods of good cultivation, including thorough sanitation, crop rotation, and the use of healthy and disease-resistant planting material.

SPIERENBURG (DINA). **Een ziekte in het Zeegras (Zostera marina L.).** [A disease of Seagrass (*Zostera marina* L.).]—*Tijdschr. over Plantenziekten*, xxxix, 8, pp. 193–199, 1 pl., 1933.

In the late summer of 1932 the attention of the Dutch Phytopathological Service was drawn by the Fishery Biological Investigation Department to the occurrence of a disease in the grass-wrack seaweed (*Zostera marina*) [*R.A.M.*, xii, p. 711] along the coast of the Zuiderzee, and on 6th September an article appeared in the *Nieuwe Rotterdamsche Courant* suggesting that the drainage operations then in progress might be a contributory cause. The disease, however, has since been reported not only from other parts of Holland (e.g., east of Texel) but also from foreign countries, so that the drainage theory is scarcely tenable.

The writer examined specimens of healthy and diseased seaweed and found that in the latter the separating walls of the air canals were shrivelled, the cell contents and in some cases the vascular bundles being brown, while a few bacteria were detected in the tissues. A translation is given of the preliminary note by Fischer-Piette and his collaborators on the occurrence and supposed bacterial origin of the trouble in France [ibid., xii, p. 308].

COTTON (A. D.). **Disappearance of Zostera marina.**—*Nature*, cxxxii, 3329, p. 277, 1933.

The available information on the gradual disappearance of the grass-wrack seaweed (*Zostera marina*) from the coasts of Canada, the United States, France, and Holland [see preceding abstract] is briefly recapitulated, and attention drawn to a similar phenomenon at the old swannery at Abbotsbury, in various parts of Devon, and in the Thames estuary. In the affected English localities artificial feeding of the swans is necessary, while the marine fauna also suffers from the removal of extensive cover. Considerable topographical and physiographical alterations, moreover, may arise through the shifting of mud and sandbanks in consequence of the destruction of the chief mud- and sand-binder of estuaries and bays.

BAWDEN (F. C.). **Infra-red photography and virus diseases.**—*Nature*, cxxxii, 3326, p. 168, 3 figs., 1933.

By means of infra-red plates the writer has secured photographs giving a perfect contrast (unobtainable with panchromatic plates) between the healthy portions of potato leaves and those infected by streak [*R.A.M.*, xii, p. 48]. The normal leaf cells reflect the infra-red rays almost completely and come out white in positive, while those of the necrotic areas are jet-black. All potato necroses, regardless of the causative virus, behave similarly.

Totally divergent results are given, however, by the photography of tobacco necroses due to the '*x*' virus [ibid., xii, p. 587], which are virtually indistinguishable from the healthy leaf areas by the infra-red process, while showing up clearly when taken with panchromatic plates. This discrepancy is attributed to the fact that the dead cells of the potato necroses contain large amounts of breakdown products, rich in pectic substances and possibly in tannins, which completely absorb the infra-red rays. The *x* type of tobacco necroses, on the other hand, consist merely of dead empty cells reflecting the infra-red rays in the same degree as normal cells. All the necroses on *Nicotiana glutinosa* leaves infected by the *x* virus and ring spot show in panchromatic photographs, but somewhat faintly; with infra-red plates, on the other hand, only the lesions containing degeneration products appear, though these come out more definitely.

PUNKARI (LAILA) & HENRICI (A. T.). **A study of variation in a chromogenic asporogenous yeast.**—*Journ. of Bact.*, xxvi, 1, pp. 125–138, 2 figs., 1933.

Variations in a chromogenic, asporogenous yeast, *Torula pulcherrima*, which occurs in nature on various fruits, and has also been recovered from the nectar of flowers and from insects, were observed in giant colonies arising from single cell isolations on 1·5 per cent. agar. The variants were red and white, smooth and rough, the last-named forms being associated with incipient mycelial production. It was possible to obtain entirely smooth white, smooth red, and rough red colonies, but not rough white ones. For a time the variants tended to breed true to type, but at length continuous instability developed, leading on the one hand to the production of further new mutants, and on the other to a reversion to ancestral forms.

QUINTANILHA (A.). **Le problème de la sexualité chez les champignons. Recherches sur le genre 'Coprinus'.** [The problem of sexuality in fungi. Studies on the genus *Coprinus*.]—Reprinted from *Bol. Soc. Broteriana*, Coimbra, viii (Sér. II), 100 pp., 6 diags. (3 col.), 1933.

A comprehensive and fully tabulated account is given of the writer's studies on the problem of sex in fungi, as represented specially by the genus *Coprinus* [cf. *R.A.M.*, xii, p. 186]. References to contemporary investigations on the same subject occur throughout the paper, to which is appended a seven-page bibliography.

ROBB (W.). **Scottish Society for Research in Plant-Breeding, Report of the Director of Research to the Annual General Meeting, 13th July, 1933.**—32 pp., 3 figs., 1933.

In the section of this report (pp. 18–21) dealing with virus disease research [by E. C. Barton-Wright, G. Cockerham, and A. M. M'Bain] it is stated that in contrast to earlier results obtained, the evidence secured in 1932 showed that potato leaf roll [*R.A.M.*, xii, p. 48] does not markedly interfere with the production of sugars in the leaf, though there was some evidence of slight interruption in their transport out of the leaf.

Every King Edward potato plant examined (60 in all) for paracrinkle [ibid., xi, p. 594] had the disease in a latent form.

Beyond a slight retardation in the rate of formation of proteins and other nitrogenous compounds in leaf roll potatoes as compared with healthy ones, there was no fundamental difference in the protein metabolism of the two series.

In general, potato seed from parents affected with virus diseases was less viable and produced a greater number of degenerate seedlings than seed from healthy parents. Leaf roll and crinkle were more effective than simple mosaic in producing degeneracy in the seedling progeny.

Experimental evidence indicated that the Golden Wonder potato is resistant to certain virus diseases and may act as a symptomless carrier. In no instance did injury to the tubers, sprouts, or stem result in the appearance of any symptoms of virus attack in a previously symptomless plant.

CURRIE (J. F.). **The production of high-grade seed Potatoes in North Wales.**—*Journ. Min. Agric.*, xl, 4, pp. 316–326, 1 map, 1933.

After a brief reference to the work on the production of relatively virus-free seed potatoes reported in an earlier communication [*R.A.M.*, xii, p. 236], the author summarizes the results of tests in 1932, in which stocks of Sharpe's Express, Great Scot, and Kerr's Pink, produced at the North Wales centres started in 1930, were for the first time compared for their yield at four centres with the best obtainable Scotch seed of the same varieties. These results fully confirmed those obtained in the earlier trials, and demonstrated that the North Wales stocks are at least equal to the best stocks from Scotland both in health and in yield.

The North Wales seed-producing centres are situated in bleak and unsheltered districts, where climatic conditions tend to keep down the aphid population, particularly before the end of July. The potato fields are small and relatively far apart, thus affording a measure of protection against outside infection. In some areas the prevailing wind from the sea appears to cause a premature ripening and death of the potato haulms, and a similar effect is brought about by the early development of blight [*Phytophthora infestans*]. Both phenomena are believed to have the same effect as early lifting of the seed tubers, which is known to minimize the amount of virus infection in the crop.

The stock produced is being marketed as North Wales Certified

Seed Potatoes, containing not more than 0·5 per cent. of virus diseases and pure to the extent of 99·5 per cent.

KÖHLER (E.). **Untersuchungen über die Viruskrankheiten der Kartoffel. II. Studien zur Blattrollkrankheit.** [Investigations on the virus diseases of the Potato. II. Studies on leaf roll disease.]—*Phytopath. Zeitschr.*, vi, 4, pp. 359–369, 5 figs., 1933.

Continuing his investigations on the virus diseases of potatoes in Germany [*R.A.M.*, xii, p. 586], the writer gives details of his successful experiments in the transmission of leaf roll from the Frömsdorf to the President and Gustav Adolf varieties by means of the aphid *Myzus persicae* [cf. ibid., xii, p. 587].

DYKSTRA (T. P.). **Weeds as possible carriers of leaf roll and rugose mosaic of Potato.**—*Journ. Agric. Res.*, xlvii, 1, pp 17–32, 8 figs., 1933.

In the experiments reported in this paper leaf roll was successfully transmitted by the aphid *Myzus persicae* from potatoes to *Solanum villosum*, *S. dulcamara*, *Datura stramonium*, *D. tatula*, and tomatoes, while rugose mosaic [*R.A.M.*, xii, p. 588] was transmitted by leaf mutilation to *S. villosum*, *Physalis* sp., petunia, and tomato. When *S. villosum*, *D. stramonium*, and tomato infected with leaf roll were interplanted amongst healthy potatoes, and various insects (including *M. persicae*) were introduced, the potatoes contracted leaf roll in 82 per cent. of the tubers tested. Rugose mosaic was similarly transmitted to 53 per cent. of the tubers by interplanting healthy potatoes with diseased *S. villosum* and tomatoes. From potatoes infected with rugose mosaic *M. persicae* transmitted to tomatoes only the veinbanding component of the virus complex. In susceptible plants the veinbanding virus alone caused very slight symptoms, characterized in soft-leaved plants by a banding of the veins; when inoculated into apparently healthy potato plants, carrying the latent 'healthy potato virus', the veinbanding virus caused typical rugose mosaic, but in potato plants free from the latter virus, it only produced a faint type of mottling. The latent virus was not transmitted from apparently healthy potatoes to other solanaceous plants by *M. persicae*, nor was it transmitted to the two species of *Datura* by five other species of insects which occur naturally on potato, although *Datura* is very susceptible to field infection with this virus, which causes pronounced mottling on it.

The investigation is considered to have established that under certain conditions solanaceous weeds growing in proximity to potatoes may become infected with certain virus diseases of the crop, and may serve as sources of the infection in the crop.

WINGERBERG (F.). **Studien über den gewöhnlichen Kartoffelschorf und seine Erreger.** [Studies on common scab of Potatoes and its agents.]—*Kühn-Arch.*, xxxiii, pp. 258–296, 3 graphs, 1933.

In 1931 the writer isolated from scabbed potato tubers from various localities in Germany 21 strains of *Actinomyces* and grew them in comparative culture on oatmeal agar with four strains

from Baarn. Though these studies have not as yet allowed of the delimitation of the species included, it was found that there was considerable variability even with the subcultures from the individual strains. Thus, one of the Baarn strains, *A. flavus* [*R.A.M.*, xi, p. 200], produced white, yellow, and green sectors, the last-named with concentric red zonations, and these maintained their distinct characters. Five of the German strains were found to be relatively tolerant of an acid reaction (P_H 4·0), but in general an alkaline reaction is preferred. The same strain may behave quite differently on various media in respect of temperature and acidity tolerance. The capacity of certain strains for pigment formation was found to depend on the composition of the medium, one of the Baarn strains, for instance, failing to produce on potato-dextrose agar the greenish-yellow and purple colouring characterizing it on oatmeal agar. The abundance of pigmentation is correlated with the reaction of the medium, fluctuating with the rise or fall of the latter. In general, the influence of temperature on pigmentation is similar to that on growth.

In varietal reaction experiments scab was induced by the application to the soil of spore suspensions of *Actinomyces*, not only the tubers but also the underground parts of the stem contracting infection. All the varieties tested, both resistant and susceptible, were in process of active lenticel formation and showed no sign of the suberization to which resistance has been attributed [ibid., xi, p. 69]. Inherent physiological factors, rather than the temporary condition of the lenticels, are considered to be responsible for the resistance or susceptibility of varieties to scab. The results of the writer's tests showed certain discrepancies as compared with those obtained by Schlumberger [ibid., xii, p. 589], notably in regard to the Jubel and Erdgold varieties which have hitherto been placed, respectively, in the highly and moderately resistant groups. With the inoculation method used by the writer, Jubel can only be classed as partially resistant while Erdgold falls practically into the susceptible class.

BERKNER (F.). **Die Ursachen des Kartoffelschorfes und Wege zu seiner Bekämpfung.** [The causes of Potato scab and methods for its control.]—*Landw. Jahrb.*, lxxviii, 2, pp. 295–342, 3 figs., 1933.

A comprehensive, fully tabulated account is given of investigations (in collaboration with H. Schröder) at the Breslau Agricultural and Plant Breeding Institute on the etiology and control of potato scab.

Discussing the possible causes of the disease under the headings of (*a*) environmental and varietal factors, and (*b*) parasitic agents, including *Actinomyces scabies*, the writer inclines to a physiological rather than to a pathogenic explanation pending the support of the latter by stronger evidence than is at present available.

In suggestions for the control of the disease by manurial treatments the use of fresh stable manure is deprecated, while green manuring is favoured [*R.A.M.*, vi, p. 684; viii, p. 458]. Applications of lime at the rate of 20 doppelzentner per hect. should be given when required after the plants are 20 to 25 cm. in height. Even

when thus applied, however, the lime caused an increase in the incidence of scab proportional to the amounts given. The application of physiologically acid fertilizers, e.g., ammonium sulphate, superphosphate, and potassium sulphate [ibid., xii, p. 651], is beneficial. Crop rotation exercises a decisive influence on the development of potato scab, the following order being indicated on light, dry soils to maintain a reaction approximating to but not exceeding P_H 6·0: rye, oats, potatoes, lupins, and serradella [*Ornithopus sativus*], all of which make virtually equal demands on the lime supply.

The results of the writer's tests on varietal reaction to scab are discussed at considerable length and compared with those of Schlumberger and others [see preceding abstract]. Absolute immunity does not appear to exist, but there are decided hereditary differences in the degrees of resistance and susceptibility, the importance of which in relation to breeding is explained.

HUISMAN (T. J.). **De gewone schurft van de Aardappelknol.** [Common scab of the Potato tuber.]—*Tijdschr. over Plantziekten*, xxxix, 7, pp. 173–188, 1933.

In connexion with this survey of contemporary studies on potato scab (*Actinomyces scabies*), to which Prof. H. M. Quanjer contributes a foreword, the following local observations made in Friesland, Holland, are recorded. The disease is prevalent on ploughed-up grassland, although the contrary would be expected from the large quantities of green plant remains in the soil [cf. *R.A.M.*, ii, p. 520]. It has been noted in places that infection is reduced by a green manure of oats, sown in August and ploughed under in the autumn or spring. In an experiment to determine the influence of fertilizers on the incidence of scab in nine standard potato varieties, there was much less infection on the plots receiving ammonium sulphate and superphosphate (some being entirely healthy) than on those treated with basic slag and Chile saltpetre [see preceding abstract].

As regards varietal reaction to *A. scabies*, the Phytopathological Service has adjudged Eigenheimer, Eersteling [Duke of York], Ideal, and Industrie to be susceptible, while Roode Star, Erdgold, Jubileum, and probably Triumph have been found more resistant. This estimate is generally confirmed by the records of the Plant Breeding Institute, except that here Industrie, with Furore and Zeeuwsche Blaue, is placed in a somewhat less susceptible category. The Albion and Present varieties are added to the susceptible group, while moderate resistance is shown by Populair, Robijn, West Brabander, Alpha, Bevelander, Bintje, Thorbecke, and several others.

HOLLRUNG (M.). **100 Jahre Kartoffelkrankheit. Ein kritischer Rückblick.** [100 years of Potato disease. A critical retrospect.]—*Kühn-Arch.*, xxxiii, pp. 27–124, 4 figs., 1933.

The writer's retrospective survey of a century of potato blight (*Phytophthora infestans*) is preceded by an introduction giving the chief landmarks in the history of the disease, which the author thinks was quite possibly present in Europe as early as 1765, when

Gleditsch described a disease appearing about the time of blossoming. Several accounts of potato 'rust' in Germany in the first half of the nineteenth century are also thought probably to refer to blight. The paper includes the following sections: development of potato cultivation; precursory references to blight and its history from 1840 onwards; external and internal symptoms and etiology of the disease; recognition and evidence of the parasitic character of the fungus; morphology and biology of *P. infestans* and its methods of infection, in general and on the individual organs of the plant; the non-parasitic theory of the blight and its correlations with weather and soil conditions, fertilizing systems, manner of cultivation, varietal characters, and senescence; the lateness and suddenness of blight epidemics; and the development of healthy plants from diseased tubers.

The control of late blight is discussed under the headings of mechanical preventive measures (based on cultural practices); physiological methods of influencing the state of health of the plant (drainage, manuring, spraying, varietal selection, and breeding); and the destruction of the fungus by foliage, tuber, and soil disinfection.

Appended are a chronological list of the authors consulted and a 14-page bibliography, covering much of the relevant literature.

Reddick (D.) & Crosier (W.). **Biological specialization in Phytophthora infestans.**—*Amer. Potato Journ.*, x, 7, pp. 129–134, 1933.

A comparative study of *Phytophthora infestans* from Californian and New York tomatoes and New York potatoes failed to reveal any morphological or physiological differences on inoculation into Bonny Best, Ponderosa, and Yellow Globe tomatoes, and Evergreen and Russet Rural potatoes. Both on tomatoes and potatoes the Californian isolation produced more virulent symptoms, but this character, being purely temporary, is not considered to afford evidence of biologic specialization [*R.A.M.*, xii, p. 465]. It is possible that the varieties of tomatoes and potatoes at present under cultivation in North America are not adapted to disclose the existence of more than one form of the parasite. Comparative tests made at the writers' request by Miss Yatzenina in Russia in 1928, and by Dr. K. Böning in Germany in 1930, showed that the forms of the fungus occurring in those countries were identical with the American. The newly reported German biotype [loc. cit.] may either have arisen from oospores or merely been brought into prominence by a hybrid possessing *Solanum demissum* 'blood'. The new form was found at Streckenthin on hybrids of K. O. Müller's 'W' (Washington) race, the original material of which was supplied by W. Stuart. Müller has stated that the origin of the 'W' wild immune plant is not certainly known, but he believed it to have come in the first instance from Chile. However, the similarity between the reaction of the 'W' hybrids and Schick's *S. demissum* plants to *P. infestans*, the late maturing habit of the 'W' race, and the fact that no blight-resistant potato has hitherto been obtained from Chile, make it practically certain that Müller's wild plant is one of the many forms of *S. demissum*, a species

unknown outside Central Mexico. Stuart's collection is known to include Mexican as well as South American material.

SCHMIDT (E.). **Unsere Erfahrungen bei der Züchtung phytophthoraresistenter Kartoffeln.** [Our experiences in the breeding of *Phytophthora*-resistant Potatoes.]—*Der Züchter*, v, 8, pp. 173–179, 1933.

In 1925 a number of tubers of the so-called 'SW' potato strain were supplied by the Biological Institute, Berlin-Dahlem, to the v. Kameke seed selection establishment at Streckenthin. According to Müller [see preceding abstract], the strain in question is derived from a cross between a semi-cultivated variety used by the South American Chilote Indians and Dolkowski's Svitez. An exceptional degree of resistance to *Phytophthora infestans* was reported by Vowinckel and Müller to be shown by this strain in field trials, but from 1925 onwards it regularly developed infection at Streckenthin, the incidence approximating to that of the medium-late cultivated varieties. Subsequent inoculation experiments with a zoospore suspension of the fungus on plants raised from tubers confirmed the susceptibility of SW, among 5,000 seedlings of which, moreover, there was not a single resistant individual.

In 1926 the Streckenthin station further received tubers of two strains resulting from a cross between the so-called 'Ef' and Polanin, the former originating in a miscellaneous consignment of wild potatoes from America. Following protracted inbreeding, the best lines of these strains (which are known as Ef strains and which maintained complete freedom from late blight and showed no trace of mycelial infection on the leaves up to 1931) were crossed with certain standard varieties and the following figures obtained: Ef × Pepo, 321 susceptible and 344 resistant = 52 per cent. resistant; Ef × Centifolia, 274 susceptible and 267 resistant = 49 per cent. resistant; Ef × Alma, 120 susceptible and 121 resistant = 50 per cent. resistant. As early as 1927 hybridization was initiated between the resistant F_1 strains with Ef parentage and standard varieties, and by 1932 there were 167,336 seedlings of the F_1 to F_4 generations, i.e. originating from strains crossed once to four times with commercial sorts. No close correlation was detected between resistance to *P. infestans* and the undesirable qualities of Ef, e.g. stunted habit of growth and delayed maturity, and a considerable number of the above-mentioned hybrid seedlings gave very promising indications of a suitable blend of characters. At this juncture, however, a set-back occurred in the form of a severe attack of late blight, to which the entire progeny of the Ef crosses, as well as the Ef strains themselves, had succumbed by the end of August 1932. There was, however, some indication of a capacity on the part of certain hybrids of the early type to impede the development of the fungus.

In the writer's opinion, the abrupt loss of resistance in the Ef progeny is attributable to the equally sudden development at or about the same time of the 'Streckenthin biotype' of *P. infestans*, most probably the outcome of mutation induced by special environmental factors [ibid., xii, p. 465], evidence against the possibility that it was introduced from abroad, or had been long present but

masked by the absence of preferential hosts, being briefly summarized.

The crossing of the American strains with cultivated European varieties presents no great difficulties, especially when the resistant Central American wild *Solanum demissum* is used as the female parent. In certain cases successful hybridization was also effected by the use of this strain as the male parent, the F_1 being relatively uniform and intermediate in type and up to the present showing 100 per cent. resistance to *P. infestans*, including the Streckenthin strain.

McCall (T. M.). **Depth of planting experiments for the control of Rhizoctonia on Potatoes.**—*Proc. Amer. Soc. Hort. Sci. 1932*, xxix, pp. 413–414, 1933.

In 1930 a series of experiments was initiated at the Maine Northwest Experiment Station to determine the relation of planting depth to the infection of Triumph potato tubers by *Rhizoctonia* (*Corticium vagum*) [*C. solani*: *R.A.M.*, x, p. 12]. It was evident from the results of these tests that covering the seed pieces to a depth of 6 in. caused a heavy increase of infection (up to 90 per cent. compared with 30 per cent. at 1 to 2 in.). Even seed tubers treated with the standard seed disinfectants showed 75 per cent. infection at 6 in. The yield from the untreated seed at 1 to 2 in. averaged 200 bushels per acre, decreasing to 150 at 6 in. The percentages of infection among the treated seed ranged from 50 at 1 to 2 in. to 66 at 6 in., at which depth and at 4 in. the excess yield of treated over untreated material ranged from 10 to 15 per cent.

Goossens (J.). **Alternaria-droogrot van Aardappelknollen.** [*Alternaria* dry rot of Potato tubers.]—*Tijdschr. over Plantenziekten*, xxxix, 7, pp. 165–172, 2 pl., 1933.

During the winter of 1932–3 the Dutch Phytopathological Service received a number of reports on the damage (up to 25 per cent. of the crop) caused by *Alternaria solani* to tubers of the Bintjes, Eerstelingen [Duke of York], and Eigenheimer potato varieties [*R.A.M.*, ix, pp. 335, 435]. The symptoms of the dry rot of the tubers, an unfamiliar development in Holland, where the leaf blight caused by this fungus is better known [ibid., iv, p. 61], are briefly described, and observations are made on the life-history of the fungus and the factors affecting its occurrence, in the light of recent studies. The writer's inoculation experiments were uniformly successful when fragments of mycelium from agar cultures were applied to wounded tubers, whereas similar tests with spores generally gave negative results. On Bintjes the resulting lesions were much more extensive than on Duke of York. Control measures are briefly indicated.

Riccardo (S.). **La cancrena secca delle Patate per fusariosi in provincia di Napoli.** [*Fusarium* dry rot of the Potato in the province of Naples.]—*Ricerche e Divulg. Fitopat. per la Campania ed il Mezzogiorno*, Portici, ii, pp. 1–16, 1 pl., 1 fig., 1933. [Abs. in *Riv. Pat. Veg.*, xxiii, 7–8, p. 324, 1933.]

Potatoes stored in pits in the province of Naples are stated to

be frequently subject to a dry rot associated with a species of *Fusarium* which in its morphological and cultural characters entirely agrees with *F. oxysporum*. It is not unlikely that the fungus is disseminated by acarids (especially *Rhizoglyphus echinopus*), which are always present in large numbers on the diseased tubers. It is suggested that the rot might be avoided by storing the potatoes in conical heaps on platforms of well-beaten earth, instead of in pits, and covering them with straw instead of with the dry potato haulms, as is the present usage in the locality.

CAROLUS (R. L.). **Some significant variations in the chemical composition of the plant associated with a malnutrition trouble of Potatoes.**—*Amer. Potato Journ.*, x, 8, pp. 147–165, 1933.

A fully tabulated account is given of the writer's investigations on the magnesium deficiency disease of potatoes recently described from Virginia [*R.A.M.*, xii, p. 654]. It was found that a 60-barrel crop of tubers removes from the soil 3 to 4 lb. of magnesium. Therefore this amount should be included in the fertilizer mixture used in periods of heavy rainfall on light soils with a tendency to leaching. Chucka (*Better Crops with Plant Food*, Feb.–March, 1932) reports increases up to 155 bushels per acre on certain Maine soils treated with 300 lb. $MgSO_4.7H_2O$ per acre. Plant analyses have shown that even small amounts of lime increase magnesium absorption. On acid soils the addition of magnesium limestone, in quantities sufficient to induce a reaction of at least P_H 5, supplemented with magnesium sulphate during the adjustments of the soil to the increased calcium content, should effect an appropriate balance and improve plant growth.

ITO (S.) & TOKUNAGA (Y.). **Studies on the rot-disease of Rice-seedlings caused by Pythium-species.**—*Journ. Fac. Agric., Hokkaido Imper. Univ.*, xxxii, 5, pp. 201–233, 5 pl., 1933.

Five species of *Pythium* were isolated from rotted rice seedlings in Hokkaido and Honshu, Japan, and are described in detail, namely, *P. oryzae* n. sp., *P. nagaii* n. sp., *P. echinocarpum* n. sp. [all furnished with Latin diagnoses], *P. monospermum* Pringsh. [*R.A.M.*, x, p. 211], and a hitherto unidentified species.

P. oryzae is characterized by hyphae measuring 1·8 to 4·2 μ (average 2·8 μ) with numerous bud-like outgrowths up to 10 μ in breadth. The sporangia are filamentous, about 3 μ in breadth, and the terminal or intercalary, spheroidal, smooth oogonia, are 15 to 23 μ in diameter, with one or two curved, clavate or oblong antheridia. The spherical, smooth, granular oospores measure 12 to 20 μ in diameter and usually contain a large oil drop, the wall being 2·5 to 3 μ thick.

P. nagaii has hyphae 1·5 to 4 μ (average 2·5 μ) in breadth, at the tips of which are produced ovoid, piriform, or rarely spherical, proliferous sporangia, 24 to 36 by 20 to 26 μ. The zoospores measure 12 by 7·2 μ (8·2 to 9·6 μ when encysted). Germination also takes place by means of a germ-tube from the apex of the

sporangium. The spheroidal to irregular, smooth oogonia, 14 to 22 μ in diameter, have a single ovoid, globoid, or clavate antheridium. The spherical, smooth, guttulate oospores measure 12 to 19 μ in diameter, their pale to dark yellow wall being less than 0·8 μ in width.

The hyphae of *P. echinocarpum* measure 1·2 to 4·8 μ (average 3 μ) in diameter; sporangia and zoospores have not been observed. The terminal or intercalary, spheroidal, echinulate oogonia measure 15 to 24 μ without the spines, the latter being 4 to 9 μ long and 1·5 μ wide at the base. The clavate or oblong, mostly curved antheridia are sometimes hypogynal (formed by segmentation in the oogonial branch). The spherical, smooth, globular oospores, 13 to 21 μ in diameter, with walls 0·8 to 1·2 μ thick, almost entirely fill the cavity, unlike those of the two preceding species.

The undetermined species resembles *P. oryzae* in its general morphology, but so far no sexual organs have been observed.

On rice-grain decoction agar *P. monospermum* grew best at 28° to 32° C. and all the others at 24° to 28°; the former alone continued to develop at 35°. The thermal death points were determined as follows: *P. monospermum*, 50 minutes at 45°; *P. oryzae*, 60 minutes at 40° or 24 at 45°; *P. nagaii*, 20 minutes at 45°; *P. echinocarpum*, 50 minutes at 45°; and *P.* sp., 60 minutes at 40° or 10 at 45°. All the species grew fairly well at 10°. The fungi made good growth on transference from a temperature of 25° to 13°, and from 15° to 25°. No zoospores were produced at 30°, whereas oogonial formation was more abundant at the higher temperature ranges.

All five species were proved by inoculation experiments to be pathogenic to rice-grains (Bozu variety). *P. echinocarpum* was the most virulent (86 per cent. infection on soil at 15° to 26°) and *P. monospermum* the least. The greatest injury is caused at relatively low temperatures. Rice-grains deprived of their seed coats were much more susceptible to *Pythium* infection than those with hulls. The percentages of infection were found to decrease with the age of the plants, those inoculated a week after sowing being scarcely affected. The growth reduction due to *Pythium* infection was most pronounced in the Akage variety at 15° to 20°.

In infected seeds the embryo turns dark brown and the diseased endosperm tissues also become discoloured, while the plumule and radicles are eventually involved. As infection proceeds the leaves and culms turn yellowish-white and the culm bases brownish.

BATESON (E.). **Rubber in North Borneo. Annual Report of the Mycologist and Agricultural Adviser for 1932.**—*Bull. Rubber Growers' Assoc.*, xv, 6, pp. 323–325, 1933.

Heavy infection of *Hevea* rubber by *Fomes lignosus* is very rare in North Borneo, but the disease is spreading, as are, though more slowly, *F. pseudoferreus* [*Ganoderma pseudoferreum*] and *Ustulina zonata* [cf. *R.A.M.*, vi, p. 750]. Estate managers now realize the importance of promptitude when dealing with outbreaks of pink disease [*Corticium salmonicolor*]. *Oidium* [*heveae*] has not so far been recorded in the State.

BRANDENBURG (E.). **Onderzoekingen over ontginningsziekte, II.** [Investigations on reclamation disease, II.]—*Tijdschr. over Plantenziekten*, xxxix, 8, pp. 189–192, 1 pl., 1933.

Continuing his investigations on the reclamation disease of oats [*R.A.M.*, x, p. 487], the writer tested the effect of the addition of 0·2 mg. of copper sulphate to plants in a nutrient solution (P_H 5·5 to 6·5), containing 0·5 gm. each of potassium nitrate, calcium phosphate, and magnesium sulphate, 0·2 gm. of ammonium nitrate, 0·36 gm. potassium chloride, 0·175 gm. ferri-ammonium sulphate, 0·5 gm. each of boric acid, zinc sulphate, and aluminium sulphate, 1 to 2 mg. of manganese sulphate, and 25 to 30 mg. of potassium silicate per l. of water.

Some four weeks after the commencement of the test, i.e., about the end of May, the plants receiving copper were in a completely healthy state and had attained normal development (110 cm. in height), whereas those without copper showed a white spotting of the young foliage, sometimes accompanied by a rolling of the leaves along the midribs and a yellowish-white discoloration of the margins. The youngest leaf in all the affected plants died, and growth ceased at a height of 20 cm. The lateral shoots profusely developed by the plants without copper also showed white spots and eventually died. The symptoms thus experimentally induced correspond exactly with those of the reclamation disease as it occurs in nature on sandy humus soils. In further tests the addition of even 0·05 mg. copper sulphate was shown to exercise a preventive action on the disease, which would thus appear to be due to the absence of copper from the soil.

The *Pythium* infection of beets [see above, p. 10], formerly believed to stand in some relation to reclamation disease, has not proved amenable to copper sulphate treatment and is thus apparently of independent origin.

SCHWARTZ (G.). **Entseuchung von Anzuchterde und Erdhaufen durch Dampf.** [The disinfection of propagating soil and soil heaps by steam.]—*Obst- und Gemüsebau*, lxxix, 7, pp. 104–105, 4 figs., 1933.

A method of soil disinfection by steam is described [*R.A.M.*, xii, p. 460], in which the heat is supplied by a system of pipes from an Akyra low pressure boiler to a tipping-cart containing ⅔ cu. m. of moderately dry soil. The steam is admitted to the cart until the thermometer affixed to the lid of the latter registers 96° C. The process of sterilization takes about 40 minutes, so that in a ten-hour working day some 10 cu. m. can be treated. Notes are also given on a simple method of sterilizing small quantities of soil by steam in a washing-copper.

BOURIQUET (G.). **Les maladies du Vanillier à Madagascar.** [Diseases of Vanilla in Madagascar.]—*Ann. de Cryptog. Exot.*, vi, 1, pp. 59–78, 6 pl., 1 fig., 1933.

A brief account is given of the more important physiological troubles and parasitic diseases of vanilla so far recorded in Madagascar [cf. *R.A.M.*, xi, p. 699]. Besides *Calospora* [*Botryosphaeria*] *vanillae*, in the east of the island anthracnose of the stem, leaves,

and occasionally of the pods was found to be caused by a fungus very similar to, if not identical with, *Glomerella vanillae* [ibid., vi, p. 695]. An anthracnose of the pods was also observed in association with an unidentified species of *Gloeosporium*. The other diseases briefly described include a pod rot developing from either end of the unripe fruit and finally extending to the whole of the latter. The parts attacked assume a chocolate-brown colour, frequently in the form of more or less extensive spots on an almost normal green ground, and often covered with a slight white efflorescence of the conidia of the causal fungus. The portions underlying the spots become less turgid and are longitudinally wrinkled, and the affected pods easily drop off. The fungus closely resembled, both in nature and in pure culture, the species reported by Maublanc and Barat from Réunion, which they considered to be *Phytophthora jatrophae* [*P. parasitica*: ibid., vii, p. 600; cf. also ix, p. 767]. Its pathogenicity was established by the authors, successful infections being produced by inoculation into vanilla pods and stems, and also into the fruits of the Barbados nut (*Jatropha curcas*) in the laboratory. Mention is also made of a root rot caused by *Fusarium batatatis* var. *vanillae* [ibid., vii, p. 669], and various non-parasitic diseases comprising chlorosis, a necrosis of stems and leaves, and a degeneration, the most marked symptom of which is a noticeable reduction in the raw weight of the pods. Control measures are indicated in the case of most of the troubles dealt with.

Varietal introductions in Puerto Rico and the Philippines.—*Internat. Sugar Journ.*, xxxv, 415, pp. 257–258, 1933.

In this brief review [the first part of which is based on a lecture by C. E. Chardon and the second on a paper by J. J. Mirasol] of the effects on yield of changes in the sugar-cane varieties grown in Porto Rico and the Philippines it is stated that in the former island, where mosaic first appeared in 1915 and by 1918 had spread over three-quarters of the sugar-cane area, the average annual yield for the seven years following 1925 (when the change to Uba and BH 10 (12) first began to take effect) was nearly 70 per cent. higher than that for the ten years before 1925, though the corresponding increase in acreage was barely 10 per cent. In 1917, when mosaic was not a serious factor, the yield in one locality was 16·24 tons, which fell as a consequence of the disease to 12·40 tons in 1921; in that year Uba was planted, with the result that by 1924 the yield had risen to 29·84 tons. Between 1915 and 1924 the loss from mosaic in Porto Rico amounted, at a conservative estimate, to 8 or 10 million dollars. Uba retained its popularity till 1927, but at present B.H. 10 (12) occupies a large acreage in the south coast region. In the mosaic-infected western districts and in poor and hilly lands P.O.J. 2725 has given superior yields to B.H. 10 (12) and is highly resistant to mosaic.

In the Philippine Islands the commercially mosaic-immune P.O.J. 2878 was first grown on an extended scale in 1929; in 1932 it was already third in respect to total yield and it is expected in the next two years to become the most widely grown variety.

D'Emmerez de Charmoy (D.) & Guézé (P.). **Situation actuelle de la mosaïque à la Réunion.** [Present situation of mosaic in Réunion.]—*Rev. de Bot. Appliquée et d'Agric. Trop.*, xiii, 143, pp. 495–499, 1933.

This paper advocates the introduction in Réunion of special legislation [a brief outline of which is given] for the purpose of checking the further spread of sugar-cane mosaic in the island [cf. *R.A.M.*, xii, p. 427]. As a first step the authors suggest subdividing the cane-bearing areas into three categories according to the prevalence and intensity of the disease, judged by its effect on the M. 131 cane which is stated to be the most susceptible and most widely grown variety in Réunion. The first two categories should include the areas where mosaic is already firmly established, and those threatened in the near future, while the third should comprise the estates where mosaic is more or less sporadic either naturally or owing to the control measures already introduced. Briefly stated, the measures proposed consist of the compulsory eradication of the most susceptible cane varieties in the first two categories, and in the prohibition of varieties of sugar-cane for the reconstitution of the plantations, other than those supplied or recommended by the competent agricultural authorities.

Priode (C. N.). **Cuban streak.**—*Phytopath.*, xxiii, 8, pp. 674–676, 1 fig., 1933.

An apparently new disease of P.O.J. 2725 and C.A.C. 323 sugar-cane, designated 'Cuban streak' and tentatively attributed to a virus, was observed in the autumn of 1931 at the Tropical Plant Research Foundation experimental plots, Central Jatibonico, Cuba. The symptoms take the form of interrupted, chlorotic-white to brick-red stripes following the leaf veins and mostly extending the whole length of the leaf, the stalks of the affected plants being abnormally small. The streaked plants were growing in a field surrounded by canes with a high percentage of mosaic from which the new disease, however, is evidently distinct. The 'Cuban streak' symptoms also differ from those of maize stripe [*R.A.M.*, xii, p. 756], and all attempts to transmit the latter to cane have been unsuccessful. The symptoms of the new disease and South African streak of sugar-cane [ibid., xii, p. 658] are not similar and the insect vector of the latter [*Cicadulina mbila*] is not known in Cuba.

Priode (C. N.). **Two hosts of the pokkah-boeng disease other than Sugar-cane.**—*Phytopath.*, xxiii, 8, pp. 672–673, 1 fig., 1933.

Young maize plants were observed in Cuba to be affected by a chlorotic condition of the leaf bases with red and black markings, sometimes accompanied by a malodorous rot and distortion of the tops and almost always by lesions on the surface of the stalk but not within it. A *Fusarium* resembling that associated with pokkah-boeng of sugar-cane [*Gibberella moniliformis*: *R.A.M.*, xii, p. 679] was isolated from the diseased tissues. Similar symptoms were shortly afterwards observed on sorghum, which showed the red markings in a more pronounced form than the maize;

where these areas dry and fall out the appearance of the plants recalls that of sugar-canes attacked by *G. moniliformis*. The fungus isolated from maize and sorghum was inoculated into the same hosts and sugar-cane with positive results, the symptoms on the last-named being typical of pokkah-boeng. Conversely, pure cultures of *G. moniliformis* from sugar-cane produced the above-mentioned symptoms on maize and sorghum.

Cook (W. R. I.). **A monograph of the Plasmodiophorales.**—*Arch. für Protistenkunde*, lxxx, 2, pp. 179–254, 11 pl., 12 figs., 2 diags., 1933.

This is an extended account of the writer's critical and taxonomic studies of the Plasmodiophorales, a summary of which has already been noticed from another source [*R.A.M.*, xii, p. 468]. The species discussed in this treatise are *Plasmodiophora brassicae*, *P. ficirepentis* [ibid., x, p. 4], *P. diplantherae*, *Sorosphaera veronicae*, *S. radicalis* Cook & Schwartz, *Sorodiscus callitrichis*, *S. radicicolus* Cook, *S. karlingii* sp. nov., *Spongospora subterranea*, *S. campanulae*, *Tetramyxa parasitica*, *T. triglochinis*, *Ligniera junci*, and *L. verrucosa* [ibid., vii, p. 744]. Other sections deal with genera excluded from the Plasmodiophoraceae and those incorporated in the recognized genera; the phylogeny of the Plasmodiophoraceae; and the relationships of the Plasmodiophoraceae with the Protozoa, Mycetozoa, and Chytridiales, respectively.

A five-page bibliography and a glossary of technical terms are appended.

Buisman (Christine). **Über die Biologie und den Parasitismus der Gattung Ceratostomella Sacc.** [On the biology and parasitism of the genus *Ceratostomella* Sacc.]—*Phytopath. Zeitschr.*, vi, 4, pp. 429–439, 1933.

A survey is given of recent literature [all of which has been noticed in this *Review*] on the biology and parasitism of *Ceratostomella* spp. under the headings of: (1) the occurrence of heterothallism in *Ceratostomella*, (2) parasitism in the genus *Ceratostomella*, and (3) the relationship between *C.* spp. and wood-borers [cf. *R.A.M.*, xii, pp. 409, 650, 665 *et passim*].

Burns (W. E.). **The taxonomic position of an aroma-producing mold.**—*Iowa State Coll. Journ. of Science*, vii, 4, pp. 433–437, 2 pl., 1 fig., 1933.

Morphological and cultural studies [details of which are given] on a mould producing a peculiar fruity aroma isolated by Dr. M. Levine from maize mash indicated that the organism agrees with *Oidium suaveolens*, described by A. Krzemecki (*Centralbl. für Bakt.*, Ab. 2, xxxviii, p. 577, 1913). The genus *Oidium* is restricted in modern usage to plant parasites known to represent the conidial stages of Erysiphaceae, and cannot, therefore, include the saprophytic mould under observation. C. Berkhout reclassified the latter in 1923 as *Oospora fragrans* [cf. *R.A.M.*, iii, p. 556], the change in the specific name being necessary because there was already an *O. suaveolens* (Lindner) Lindau. The greater suitability of the genus *Cylindrium* for organisms with cylindrical conidia

of this type was apparently overlooked. The adoption of the new combination *C. suaveolens* for the aromatic mould is proposed.

QUANJER (H. M.). **Über eine komplexe Viruskrankheit des Tabaks.** [On a complex virus disease of Tobacco.]—*Phytopath. Zeitschr.*, vi, 4, pp. 325–333, 2 figs., 1933.

In continuation of the author's study with K. Silberschmidt of the effects of inoculating tomato plants with two kinds of virus, namely, ordinary tobacco mosaic and acronecrosis from outwardly healthy Magdeburger Blaue potatoes [*R.A.M.*, xi, p. 808], similar tests were carried out in 1932 at Wageningen, Holland, on Amersfoort tobacco plants, which were inoculated by rubbing the leaves (*a*) with each of these components separately, and (*b*) with a mixture of both.

The plants inoculated only with tobacco mosaic developed the well-known symptoms of this disease after a fortnight. Those inoculated with the expressed sap of Magdeburger Blaue potatoes showed in two to three weeks numerous small, circular spots constituting a transitional stage between 'mottle' and 'ring spot' [ibid., v, p. 119; xii, p. 473]. Plants inoculated with a mixture of the mosaic and acronecrotic viruses at first developed the typical mosaic symptoms, then those of the ring spot, and later a necrosis of the base of the midrib of the older leaves and neighbouring parts of the stem, a condition resembling Schaffnit's and Müller's description of streak necrosis [ibid., x, p. 537]. Their description may be supplemented by the following points. A faint, striate, shiny swelling of the cortex is the incipient stage of the brown stripes on the stems. The uppermost foliage also shows the characteristic symptoms of mosaic, while in some cases the upper halves of the leaves developed mottling and the lower ones necrosis. In order, however, to obtain complete certainty as to the identity of streak necrosis it is necessary to repeat the synthesis in the locality of the spontaneous occurrence of the disease, and further to analyse the components (1) by separating the tobacco mosaic virus from the mixture by ten minutes' exposure to a temperature of 80° C.; (2) by separating the potato virus from the mixture by passage through *Datura stramonium*; and (3) by separating the first components from the apical leaves of tobacco as soon as the early symptoms of mosaic appear.

A brief summary is given of recent literature on the viruses under discussion.

MOORE (E[NID] S.) & SMITH (A. J.). **Control of pests and diseases in Tobacco seedbeds.**—*Farming in South Africa*, viii, 89, pp. 305–306, 1 fig., 1933.

Directions are given in popular terms for the control of tobacco seedling diseases by the use of clean seed, the choice of suitable sites for seed-beds, their preparation, sowing, and care, seed disinfection, and spraying. The yellow varieties, such as Burley and Sterling, are stated to be the most susceptible to disease, especially damping-off [*Pythium de Baryanum*, *Corticium solani*, and other fungi] and wilt [*Fusarium oxysporum* var. *nicotianae*], and should not be grown where trouble from these is anticipated.

SAMUEL (G.), BALD (J. G.), & EARDLEY (C. M.). **'Big bud', a virus disease of the Tomato.**—*Phytopath.*, xxiii, 8, pp. 641–653, 5 figs., 1933.

'Big bud' of tomatoes, originally named 'rosette' by N. A. Cobb (*Agric. Gaz. New South Wales*, xiii, p. 410, 1902), occurs in all parts of Australia, being most prevalent, however, in New South Wales and Victoria. Usually only a very small percentage of plants is affected, scattered at random over the field. In South Australia, no case of more than 5 per cent. infection has been observed over a ten-year-period, but 50 to 100 per cent. infection has been noted in New South Wales. Big bud is most prevalent in mid- and late summer (January-February).

The first sign of infection appears at the tips of actively growing shoots. The youngest fruit truss and its buds assume an upright position, and the calyx enlarges to a bladder-like body with a toothed aperture at the top. The calyx veins, the under sides of the young leaves, and the youngest part of the stem often show a purple colouring (anthocyanin). The axillary buds form shoots affected similarly to the main shoots, while the diseased stems show a gradual thickening (up to 1½ or 2½ cm.) due to abnormal tissue formation in close association with the internal phloem. Adventitious root initials break through the epidermis, and longitudinal fissures may appear, exposing the internal tissue in characteristic scars. Unpruned plants acquire a very tufted, rosette-like form of growth due to the development of numerous lateral shoots and axillary buds, and to floral proliferation. The formation of small, lateral leaflets from the main and secondary petioles is stimulated, and there may be some upward rolling of the leaf margins. The youngest leaves turn yellowish-green, usually purple underneath, and as the disease progresses the leaves become continuously smaller until finally they may be only 1 to 2 cm. long. The corolla of the opening flowers may become stunted or enlarged and completely virescent, accompanied in either case by cessation of growth of anthers and ovary. The gynoecium may be carried up 1 to 2 cm. on the proliferation of the central floral axis, and in such cases there is usually distinct phyllody of the carpels, but sometimes the proliferating branches terminate in a second series of affected flower buds; the short, dichotomously branching apical shoots bear minute, hyaline papillae (apparently homologous with ovules), intermingled with a few small leaf rudiments, and are usually strongly coloured with anthocyanin. Fruit already set when invaded by the virus is immediately arrested in growth, whereas in very young fruit there may be very slow development of the placental tissues, bursting the thin ovary walls. Adventitious shoots may arise from any part of the pedicels or placental tissue, and even from between the arrested ovary and the calyx. Fruit still green at the time of infection becomes hard and tough and colours slowly if at all. In younger fruit there may be a necrosis of the embryo centres, which are embedded in a firm parenchymatous tissue with thick cellulose walls.

A greenish, water-soaked tissue develops in connexion with the internal phloem in the diseased portions of the stem and in fruit trusses, petioles, and midribs. The bulk of the abnormal tissue

consists of small cells with prominent nuclei, sieve-tubes being rare and isolated tracheids present. The tissue arises first in scattered groups, resulting from the division of separate pith cells, and increases to a continuous band. The presence of the adventitious tissue is accompanied by extensive starch formation.

Big bud was readily transmitted from diseased to healthy tomatoes by budding and grafting, the incubation period ranging from 28 to 56 days. Attempts to infect tobacco and *Nicotiana glutinosa* failed. Field plants of *Solanum nigrum* showed some typical features of big bud, including dwarfing of the foliage, numerous axillary shoots, the replacement of the flowering trusses by short branches with terminal papillae, and the production of adventitious internal phloem. The parallelism, as regards effect on the host, between big bud and false blossom of cranberry [see above, p. 41] is noted.

La maladie du fil. [Thread disease.]—*Direct. Gén. Agric., Comm. et Colon., Service Défense Végét., Mém.* 10, 5 pp., 2 pl., 1933.

Notes are given in popular terms on the symptoms, mode of dissemination, and control of the 'thread' disease of tomatoes (so called by reason of the slender, dark brown lines running along the vascular bundles of the stem) due to *Bacterium solanacearum* in Morocco.

DUFRÉNOY [J.]. **Reconstitution par les Châtaigniers japonais des Châtaigneraies détruites par la maladie de l'encre.** [The regeneration by Japanese Chestnuts of the Chestnut groves destroyed by the ink disease.]—*Congr. Morbihan. de la Forêt et du Châtaignier, 1932*, pp. 56–63, 7 figs., [? 1933].

To the best of the author's belief, not a single one of the thousands of Japanese chestnuts planted during the last ten years in Limousin has succumbed to the ink disease (*Phytophthora cambivora*) [*R.A.M.*, ix, p. 72], and inoculation tests at the Migoule (Brive) experimental plantation gave almost completely negative results on these varieties, while killing most of the indigenous trees. Laboratory experiments have shown that the resistance of the Japanese chestnuts is due to the rapid production of phenolic compounds in the cortical cells threatened by the fungus [ibid., xi, p. 391]. The symptoms and etiology of the ink disease are briefly described, and notes are given on the characteristics and requirements of the Japanese chestnuts.

Statutory Rules and Orders, 1933, No. 1011. Destructive Insect and Pest, England. The Importation of Elm Trees and Conifers (Prohibition) Order of 1933. Dated October 24, 1933.—2 pp., 1933.

The Importation of Elm Trees and Conifers (Prohibition) Order of 1933, effective from 1st December, 1933, prohibits the landing in England or Wales from any country other than the rest of the British Isles, of any living plants of *Abies, Larix, Picea, Pinus, Pseudotsuga, Sequoia, Thuja*, and *Tsuga*. The importation of living elm trees from any European country has been prohibited since 1927 [with a view to the exclusion of *Ceratostomella ulmi*,

the agent of the 'elm disease': *R.A.M.*, vi, p. 384]. This Order is now revoked, but its provisions have been incorporated in the new Order and extended to elm trees from all countries outside the British Isles. The new Order further requires that the health certificates prescribed under the Importation of Plants Order of 1933 [ibid., xii, p. 799] to accompany living plants imported from abroad must contain a statement vouching for the absence from the consignment of any of the prohibited genera.

[Similar regulations are prescribed for Scotland.]

Notice of Quarantine No. 70 on account of the Dutch Elm disease. —*U.S. Dept. of Agric. Office of Inform. Press Service*, 4 pp., 1933. [Mimeographed.]

The recent outbreak in New Jersey of the Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) [*R.A.M.*, xii, p. 794] was immediately followed by the discovery of the fungus in elm burl logs imported from Europe in which also were found the bark beetles (*Scolytus* spp.) concerned in its dissemination. As a result Quarantine No. 70, effective as from 21st October, 1933, was imposed and prohibits the importation from Europe of (*a*) seeds, leaves, plants, cuttings, and scions of elm or related plants of all genera of the Ulmaceae; (*b*) logs, lumber, timber, or veneer of such plants if bark is present on them; and (*c*) crates, boxes, barrels, packing cases and similar articles manufactured wholly or in part of the wood of these plants if such wood is not free from bark. Logs from which the bark has been removed may be imported from Europe only under a permit from the Secretary of Agriculture, to whom immediate notice of their arrival must be given; within 20 days of receipt and before the removal of any waste or trimming, the logs must be treated, under official supervision, with hot water or steam in such a way as to subject the whole interior of each log to a temperature of not less than 180° F. for at least two hours, or by some other approved method, failing which arrangements will be made for the removal of the consignment from the country or its destruction. Should inspection disclose the presence of the above-mentioned insects, indicate improper storage pending treatment, or give rise to the suspicion of risks of spreading the disease or its insect vectors, the permittee shall be notified and adequate safeguards prescribed, neglect of which will involve the seizure and disposal of the logs or the suspected portions thereof at the discretion of the authorities.

Importation of Citrus trees and products.—*Farming in South Africa*, viii, 89, p. 316, 1933.

Proclamation No. 139 of 1933 of the Plant Regulatory Service, Division of Plant Industry, Union of South Africa, extends the prohibition on the importation of all kinds of citrus trees, fruit, scions, cuttings, bark, peel (exclusive of candied material), and leaves to the whole of Portuguese East Africa on account of the risk of introduction of canker [*Pseudomonas citri*: *R.A.M.*, xii, p. 463. This disease has recently been found to occur in Mozambique Territory].